

PRINCIPLES AND IDEAS
FOR DOHERTY MEN

Volume V

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Congratulations Mr. Doherty

from the 17,000 men of your Organization who say you are the greatest, whitest, straightest man they know.

You still hold the honor of working harder than any other man in the Organization. At forty-nine you have more pep than the most of us who are twenty-nine.

We are glad you are a real American and that you proved it with talent and money through the war, that you helped the boys who enlisted with Uncle Sam and kept the door open when they returned. We are glad that you don't get cold feet at every financial flurry and of your wise guidance in any emergency.

We are proud that you are "regular" and not a fanatical reformer, hypocrite or kill-joy, and that you made good in life without being petted by a father, brother or rich patron, that you didn't have a wife to whine to, and that money never made a fop, fool, miser or snob of you.

It is a great thing for us and for the whole country that you worked long hours to accumulate enough practical plans to keep a million men busy and prosperous. No wonder that Albert Hubbard called you "Themistocles" who could make small towns into large cities. No wonder you have such an army of friends, because you are a friend.

Here's to you and a long life of happiness!!!

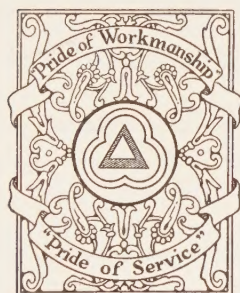
May 15, 1919.

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PRINCIPLES AND IDEAS FOR DOHERTY MEN

Papers, Addresses
and Letters by
Henry L. Doherty

Compiled by
Glenn Marston



Volume V

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There is no virtue in opinion simply because it is shared by the many. The world is gradually through the centuries emerging from a sea of errors. Truths come first to the individual, then to the minority, and last to the majority.

—HENRY L. DOHERTY.



1919

Readjustment was paramount in 1919. In the previous year every energy had been bent toward winning the war. The great offensive of the Central Powers from March to the end of June brought everyone to the sober realization that the war was to be won by fighting, and that successful fighting could only be conducted by the coordination of every physical and economic resource of the nations desiring victory. It was not until July that the tide was turned, and it was not until October that victory began to be definitely in the air.

The Armistice came on November 11, 1918, barely seven weeks from the end of the year. The whole national program had to be changed. The huge economic wastes inseparable from war had to be stopped. Paramount to everything was the handling and proper distribution of the vast number of men out of employment, or undergoing change of employment. Many men in the oil and public utility business came back from the fighting line to their old industries. It was worth while to utilize the national loyalty which was theirs, and build on it the industrial loyalty which is required of men who seek success in the paths of commerce. In the electric light and power industry the opportunity for the returned employe to revive interest in his occupation already existed in the company sections which had been originated by Mr. Doherty years before and adopted by practically all the important companies of the country. At the 1919 convention of the National Electric Light Asso-

ciation Mr. Doherty discussed the field of the company section and its value in cementing friendly relations between the company and the employes. He said:



R. CHAIRMAN and Gentlemen: I have been trying to avoid every sort of a speaking engagement lately, but I accepted the invitation to come here with great pleasure, and I really consider it a wonderful opportunity to be able to talk to you men. I have the greatest faith in what can be done, as Mr. Eglin says, through the company section movement for the man and the company, and heartily concur in what he said. I believe that there is a great future for this company section movement.

You can shut me off whenever you want to, but this is an opportunity I desire to take advantage of, and I do not want to stop until I know that every man here is as enthusiastic over what good company section work means as I am. First, I am a believer in business—I am a believer in the philanthropy of business. I believe that Mr. Carnegie as the great ironmonger was perhaps more a real philanthropist than Mr. Carnegie as a philanthropist. You or I, perhaps, go out and develop a waterpower in some western city, and carry the current generated by that waterpower to the nearby cities and markets. We start in, as a rule, by furnishing those who have been generating their own power with current at cost, we will say, or half, or even as low as one-tenth of what it cost theretofore, and it is really interesting to think what the business man does for the people at large. You know a healthy business is always founded on serving the public with some commodity, or something, at less than its real and actual value to the public.

In a business of that kind there are two elements: one is the cost of production, that you cannot get below, on the average, and the other is the value of the commodity or the service to the public. Between these two limits the price must be fixed, and you perhaps have as much right to fix the price toward the upper line as toward the lower line; yet the tendency today is to crowd down toward the lower line, even though the service we perform and the commodity we furnish are worth, from the value of service rendered, several times what we charge for them.

There is no philanthropist like the business man who puts his business on a good, sound business foundation of selling his service at less than it is worth, really, to the consumer. When you have done all you can to civilize mankind with schools and churches, then start in business and you will make real progress in civilization, if the business is carried out on correct lines.

Now, we have a school system, and I sometimes question its efficiency. You know we turn men out of our schools and colleges and each one has exactly the same education that the other fellow has. They are just like so many postage stamps. A postage stamp, you know, is a beautiful steel engraving, but it is worth only two cents, and it is not the education men get in schools that makes them valuable. What makes them valuable is the education they get of a specialized nature, that the other men do not get in school, and that is where the company sections can train these men.

We have a lot of people in this country who, no matter how little or how well they are educated, are over-educated and under trained. Now, we must change our methods and go in more for training, even though we extend our system of education. Training is the important thing. Our facilities for training are very limited, and I know of nothing that offers the opportunity for training that is offered by these various company sections.

I did not come here prepared to make an address. I am going to talk to you simply about whatever comes to my mind. It may not be and probably will not be in good order and sequence, but I hope that here and there I can give you some suggestion that will be valuable in this company section work.

You know that work well done is a pleasure. Work that is done simply for wage is always a hardship. I know what can be done in the training of men. I have taken men who could not read or write and have taught them to analyze their fire in the boiler room and to analyze their flue gases and be able to tell what it means—to tell what over-ventilation was, and to calculate from tables what their loss was in coal, having proper flue gas analyses. When you get men interested in their work, the work becomes a pleasure.

I have been worried over the situation I have seen developing throughout the United States during the period of the war, and especially since our country became involved in it. It

seems to me, no matter where I go, I see a woeful lack of pride in workmanship, and I hear a great deal about incompetency in workmanship. There is no longer any great pride in service. You see that in every hotel you go into. It has worried me—this tendency to fail to do the best that can be done with each particular job of work. I have feared that it might creep into the organization I have founded, and I have tried to keep the interest of my men up to the point where they would do the best possible work that can be done in each individual case. I have also a keen interest in the entire electrical business, because I have devoted so many years of my life to it.

The public is interested in the electrical business—it believes its interest in the electrical business is in getting low rates. That is not true. The public is primarily interested in having complete service from a geographic standpoint. There is very little satisfaction in having service selling at some place at little cost, when you cannot buy it at all, so the public is interested primarily in complete service from a geographic standpoint, secondly in good service and, thirdly, in low prices. Every time I have to deal with these problems affecting service, which come up in the central station business, I think how these things may be made plain to the public through educational work carried on in the company sections.

For instance, we have a problem on our hands now that is national, and involves even the continuity of the present form of government in this country. I do not know whether you men appreciate the enormous amount of unrest and threat there is to the existing order of things. I have been serving on a committee that has been trying to do some work along that line, and we know that there are in existence in the United States over four thousand soviets, fanatics, who believe there is some other road to wealth, to existence, than by work. These men are prepared, at some opportune moment, to grab control of the property of the country and live without work.

Unfortunately, we are going through a period of time when there is no class of society in America that has not these resentful members. Our wealthier people resent the heavy taxes that are imposed upon them, and which I myself think are thoroughly unjust and unnecessary. Our business enterprises are taxed without any justice whatever, because a corporation is, after all,

a poor man's partnership, and when the corporation must pay, and the stockholders afterwards must pay, it is an unreasonable form of taxation. You can sift down through the list and find other classes of people in this country which have members who are resentful of the existing order of things. We have the peculiar situation of a number of classes of men of the most diverse opinions who are opposed to the existing order of things and condemning more or less our form of government.

I refer to the talk made by Mr. Gordon last night as an illustration of what a wonderful thing it would be if our company sections were so organized and conducted that the company could always reach its employes through the medium of the company section, and reach the public through the company section by way of its employes. I have always had a rather large vision of what could be done in this company section work. It is no idle dream on my part—it was once. I have been a dreamer all my life, and I have spent the biggest part of my life trying to make my dreams come true. I have repeatedly organized men, and not having the opportunity of organizing them as a branch of the N. E. L. A., and not having the added incentive of pride and aid that would come from that I have organized my employes along general lines, and have been largely able in that way to maintain a proper understanding between the company and its employes, and also in that way have my employes interpret the company properly to the public in these cities. It can be done, not in one case only, but in all cases.

We have the men to think about, because there is many a good man who has no particular opportunity to get ahead. I may be the manager of the plant. I may not know I have talent underneath me. I remember once I was the president of a company, and I was in the habit of having a meeting of the heads of departments. The men also had an organization of their own, and they called themselves, jokingly, the "House of Representatives." So I termed my meetings the "Senate," and we had a good natured fight back and forth—a rivalry as to which of the meetings could be more successfully conducted.

A new manager was appointed in this company I refer to—I was not thoroughly in control of the company—and this new manager was appointed. Later on I found he rather resented talking to the men who occupied subordinate positions and he

was not in the habit of attending the meetings of the "Senate." I called his attention to it once or twice, and one day he confessed to me he did not think it was the proper thing to sit down and talk to these men on terms of equality. I said, "There are better men than you and I in the new business department soliciting for \$75 a month." There is a lot of truth in that—you have many excellent men in the organization you do not know anything about, and you can bring about a knowledge of their excellence only by some such organization as the company section. The company section is a means of showing you what talent you have, and also a means of developing talent.

I do not know how many of you men are college educated men. I am not. I often wish that I were; I wish that I had had a college education, but I did not have the opportunity. It has been a great hardship to me not to have had such an education, but sometimes I think it has been a great blessing. During the past two years I have been engaged almost entirely in war work, trying to work for the government as engineer, working with various departments and passing on various things, and have had to contend with many of the scientists who were in the government service when the war started, or were drawn in after we entered the European war. I rather concluded before the war was over that I was awfully glad I had not had a college education, because the man with a college education is blessed with the same knowledge everybody has and is cursed with the same errors. The man who has educated himself will come to his viewpoint by some other process, and if he is wrong he has lots of people to correct him, and if he is right he can generally demonstrate it.

I do not know of anything that will aid the cause of democracy more than to give the fellow who has not had an education a chance, and I want to tell you fellows who have not had to try to educate yourselves that it is a problem, but it is marvelous how much we can pick up by association with other men and by hearing things discussed. I do not know whether you have thought how much easier it is to get information from the other man than it is to get it from a library. If you want to put a library on a par with getting information from a man in conversation, you want to invent a library in which you can speak to any book on the shelf and it will jump off, open to the right page

and tell you what you want to know; and when you do not understand it, you can ask it a question and it will answer you. That is one of the reasons why there should be association between individuals, and anything that makes for that association makes for education.

You know that the American public is imbued with one idea, among many others, and that is letter writing. They think that the man who is illiterate is ignorant, and the man who is literate is wise. I think the biggest damn fools I have ever known in my life were thoroughly educated, and many of them had doctors' degrees, and I think some of the wisest, brainiest men I have ever known have been men who have not received any extended education. In one instance it was a man who could neither read nor write, and in another case a man who had had but two years of schooling. I remember a letter I once received from that man, that I thought was the greatest sample of the proper use of the English language that I ever saw; it was about two pages long, and you did not need to add a word to it, and you could not take a word away from it, because it was so perfect and concise. There was not a capital letter nor a period nor a comma, nor any other punctuation in it, and yet you could not mistake what that letter meant; it was as clear as a bell. I took it back to my office and I said: "Fellows, don't for a moment think that I believe, as many of you do, that grammatical English is good English. Here is a letter which I consider written in the most perfect way, and if you can write as good English as that when I am in London and you send me a cablegram—because punctuation marks do not go in cablegrams—I shall be satisfied." So we must learn to distinguish between the real thinker with real brains and the man who does not possess these qualities—not whether the man simply uses proper grammar when he expresses himself, either in speaking or in writing.

We have a lot of undeveloped talent in the companies, and we can do a great deal to develop that talent. I do not think that Mr. Edison has had much schooling; I think, as a matter of fact, he had but very little. Many of the men who have educated themselves have made great successes of themselves; in many cases they are more successful than the man who has the benefit of a college education. More of the men would have made successes of their careers if they had had opportunities leading

to success, and we can give that opportunity to the men in our various electrical departments through the medium of the company sections.

I have not seen the inside of a schoolroom as a student since I was twelve years old. I did not have the good fortune, as some of you had, to work with men who had college educations. In the first company with which I was connected we never had a man in our employ who had more than a high school education, and a high school educated man was a rarity; those were the surroundings under which I had to try to educate myself.

When I was in school I did not even learn how to study, and as a consequence was not very far along in my studies. When I realized what an ignorant little rascal I was, I tried to educate myself, and I know of no more difficult task I have ever had than that. I did not know how to study or what to study, and did not have anything to study with. Most of the education I had I got out of catalogues around the office—a book on heat, and Trautwine's Handbook, and a few things like that, and from these things I got the rudiments of my education. In our companies there is no reason why the boy who wants to get an education cannot get it, and we ought to carry the opportunity to get it to him largely through these company sections.

In my own organization I have tried to teach pride of workmanship and pride of service, and that ought to be the key word of the entire electrical fraternity. At the time the war broke out I received a letter from a friend of mine who is a United States Senator. When I read it I was about as mad a man as you could find any place, because the letter virtually accused me of staying on the job and trying to make money while the country was at war, while I happened to be one of the men whom the country most needed—being a man who had carried on organization work all my life and had made a success of it. I did not answer the letter for several days; then I undertook to tell this gentleman that organization such as the government proposed would be impossible without the electrical service it required, and that I was continuing my business because it was a war necessity, and was devoting all the time I could to other government work. The organization work I have done has been successful—and I say that, perhaps modestly; it has been successful because I depended primarily on inspiring my men to the point

of taking a great interest in their work. My first executive job was as foreman over a few Irishmen, and it did not take long for me to learn that if I wanted these men to work while I was captain, I had to do it by some other method than the man who could stay on the job and swear at them. I tried to get them interested and to work for me as a matter of friendship; but when it comes to military organization and carrying out a war program perhaps that plan will not do; in private work, especially in our electric light business, that system will work, because I have worked it. I have tried to make business pleasant in our different organizations, and whenever business could not be made pleasant I wanted to leave it, because I believe there is more fun in working than in playing. Every man can find pleasure in his work if he chooses to look for it.

I believe in the entertainment feature of these various company sections, but I do not think they should be indulged in too much. I do not think you want men who are members of the company sections simply for the entertainment they get. We can make these company sections educational in the highest degree and yet make them thoroughly entertaining.

I sat last night and listened to Mr. Gordon talking on socialism. It was a very instructive thing to me, and I derived more interest and more pleasure out of it than if I had gone to a theatre. A few weeks ago when I was down in an oil field in Texas with a party of gentlemen—we were down there to look over the property—I looked in a doorway and found a blacksmith at work. He was a very pronounced example of a master workman, and I stood there and admired him for a long time, and in the meantime the group of gentlemen who had gone further down the street returned and said: "You fool, did you come down here to see a blacksmith at work or to see the oil fields?" I said: "I am getting a good deal of satisfaction in seeing this man work, because he is a master workman." He had a class of work to do in which he probably took pride, but every man cannot take this pride in his work—it depends largely on the circumstances around him.

Pride of workmanship is a self-exciting thing, and neglect of workmanship is a self-exciting thing in an organization. You can build it up or down; the tendency is to build downward, unless you decide to build upward.

I know the history of the growth of this business. I remember well when my father came back from the Centennial Exposition in 1876, when I was a boy six years old, and told about having seen the electric light and also the telephone. Later on, when the first arc plant was run in the city where I lived, I fired the boiler the first night. So in the span of a lifetime I have seen the electrical business develop.

I have known personally the men who have contributed to the great inventions, especially among the American inventors, and the bulk of the work has been done by Americans.

Speaking now of the science, not of its application, ours is the newest science we have, and yet the most wonderful and accurate. During the period of our war work I had a great deal to do with airplanes. I knew nothing about them until the war broke out, and when I was called upon to do this work at that time I secured all the text books I could on them—and they looked awfully learned. After I studied the text books for a while they did not seem to read true and I then commenced to study them very closely, and I came to this conclusion: That my acquaintanceship with men engaged in airplane work, with the men who had taken up this particular branch of science, showed me that the men who were earlier engaged in the work were highly imaginative, and then they had been followed by the men who were highly academic, so well grounded that they could scent ideas and principles, such as the development of the electric business, at night, and I got into the business of demonstrating the possibilities of the airplane. We have had the greatest brains of our generation applied to this science.

I hear many people talk of electricity being in its infancy, and I have reached the point where I cannot help smiling when I hear the statement, because the science, as a science, is so nearly developed that you can make the statement referred to of almost any other science, and it would have greater truth; but the matter of application is different. It took many years after the steel plow was invented to get the man to discard the crooked bough to plow with, and we are awfully slow in getting the extensive application of electricity that should be had. Electricity has not been applied to anything like the number of uses to which it can be applied, and I do not know the limits of its application. I cannot visualize them.

If I had my chance to be a philanthropist and work for the good of mankind, I do not know of anything better that I could do than to start out and put a fan in every home. You would do a great deal more for humanity in that way than nine hundred and ninety-nine out of every thousand preachers do. I remember one day several years ago, I saw a little woman, a rather frail-looking woman, wheel her baby out across the sidewalk in a little bit of a cart. I had not seen one of them before. She wheeled it out to the street car and took her baby out, and the baby looked as heavy as a chunk of lead. When she got on the car with the child she folded the go-cart up into a form not much bigger than a little leather music case, and I looked at that and thought that the man who developed that little baby cart did more for the good of humanity than all of the reformers who have lived during my lifetime.

All they did was to promise to give salvation to man in a future state. The work we are doing is real, present-day work, and we are working for the good of the public and for the comfort of humanity. The men must be taught in some place how to do that work, and inspired with the necessity of that work and the place to do that is in the company section.

In inaugurating this plan for company sections we had in mind this objective—that there must be some place to develop men who can take larger and bigger positions with their own companies, who can take larger and bigger positions in the electrical field; and that we would develop in these company sections the men most capable of running and operating the state sections, the geographic sections, and from the state and geographic sections we will find the men best capable of running the national section. Unfortunately, we have had a great many things to contend with.

I am responsible for the plan of reorganization of the National Electric Light Association, which was adopted in 1908, and it rather amuses me every once in a while when somebody comes along and is going to change it, for, as a matter of fact, they do not know what is in the present plan. It resembles the reformers who are always going to change the constitution of our country and our form of government, without knowing what the present constitution is or what our present form of government really is. I often say that our forefathers gave us a piece of pure Colonial

architecture; then along comes somebody else who wants to tack on a piece of Queen Anne architecture, and someone else who wants to tack on a piece of Mary Ann architecture, and they are in this way likely to crucify the whole structure.

That is true of the plan of the National Electric Light Association. We have quite a wonderful plan, and if you study it you will find this: First, that any group of men interested in promoting anything in the electrical business can, by petition of a certain number of Class A members, company members, form a section to carry on the work that they are interested in—it does not require a large number. If you have a hobby and find other men who have the same hobby and want to form a special section for the furtherance of this hobby, you can do it. And the authorization of the executive committee with regard to the formation of these sections is mandatory and not discriminatory.

The idea involved in our present plan is to try to build up a great big central organization and not have a lot of conflicting organizations, and I look on the foundation of all this work as being the work of the company sections, where the first steps toward the development of the men to carry on this work are taken. I also think in carrying on a national organization of this sort we do not want to make the men go to the work, but you ought to take the work to the men. If you want to show some great theatrical star, you do not import an audience from San Francisco to New York to see that star, but you send the star to San Francisco. In the old days of the stock companies the star travelled about, and he found a supporting company in practically every place where he desired to perform.

I had also hoped that these company sections would receive support in the form of a lecture bureau maintained by the N. E. L. A. and also maintained by a committee of you men interested in company section work. There should constantly be brought to the members of your sections in your meeting rooms the most interesting lectures on new development and machinery, new processes and new ideas of every sort occurring in the industry, and matters of public interest, such as the lecture of Mr. Gordon last evening should be brought to you.

Another thing I wish to say, gentlemen, is this, and I say this because I am assuming I am talking to men of various grades, from the executives of companies to the men who have never

held an executive position—we are all too apt to think that the whole problem of running everything is up to the “big boss,” whoever the big boss is. The big boss has so many things on his mind, and so many things he ought to attend to personally, that the most valuable man in a company is the man who thinks out what the big boss would like to have done, and then puts the matter up to the big boss in concrete form.

You men are the ones who must tell us what to do to make these company sections interesting. I do not think we have done all we could for Class B members. For every five-dollar bill they spend in the company sections work they ought to get a return in value of service of \$50 or \$500—they should be given that much benefit, but that does not mean you have to spend that amount of money on them. If I were running one of these big manufacturing companies I would consider it a splendid opportunity if I could enlist the friendship of, and get in touch with, the men who will be in control of the electrical business, and talk to them about the things I am doing, the developments I am planning, the improvements in steam turbines, or anything of that sort.

I will suggest two or three things you can do, and one is this: Have you considered whether you could do more effective work as a national special section of the N. E. L. A. and have a company sections' section? By working as a special section you can elect your own officers from time to time and do not have to go to the executive committee to have it appoint them for you; it will merely confirm them. You can make every man eligible to your special section who is an officer or has been an officer of your company section. This special section can bring in every year the men who developed into interesting and instructive lecturers. You can listen to these lectures and decide which ones you will send out over the circuit. Can you imagine a greater way of stimulating your men to greater effort than the possibility of their being able to make a round through the larger company sections to address them? I know that would have been a rare opportunity for me. You know the old story—someone said that there is plenty of room at the top of the ladder. Some other fellow said: “Yes, but what is the use of that, when the bottom rounds are crowded and you cannot get up?” That condition more or less prevails, and the hardship is in getting past the

lower rounds of the ladder, where you have the greatest competition. As you get up the competition is less severe. The way to stimulate your men to bring out good papers is to give them the opportunity to go out and address the other sections.

After you have formed your company sections' section—and I see no reason why you could not form it at this meeting, if that is your decision—you ought to appoint a committee to go to the various manufacturers and convince them that they can well afford to put out lectures, if possible, illustrated lectures and diagrams, and moving pictures and things of that sort, and have these lectures given by representative men in their companies. I do not know how many of you recall a lecture which the Illuminating Engineering Society put out. I think it is one of the most interesting and constructive things, from the standpoint of illumination. Any manufacturing company that cannot bring before your company sections wonderfully interesting lectures, given by prominent men, having to do with their work and representing their work, is away behind the times. In fact, I am afraid our manufacturing companies are behind in this respect, because they certainly are not as much interested in this matter now as in the days when some of the old pioneers were living—men like Mr. George Westinghouse, and when Mr. Coffin was a younger man. But I will do this, gentlemen, if you see fit to take that work up, I will agree to go with your committee and work with it with these people and try to get them to do that. If I cannot coax them into it, I can give them a cussing, and some of you fellows could not do that, because you are not old enough.

I made some notes while I was sitting here, and the first is that I wish I could inspire you with a determination to start in and make this company section work the one feature that will stand out in all of the N. E. L. A. work. It can be done. One thing you ought to do is this: Say to anybody who is willing to come out and give a lecture that is well worth while that you will not ask him to go to Toledo and address the Toledo section on a Tuesday night, and then wait until week after next and then go to Cleveland to address the Cleveland section on a Friday night two weeks after, but that you can always call a meeting of your section on twelve hours' notice to hear any of these lecturers who are passing through your city, and that you will suit the time of your meeting to his itinerary. In that way a man can

be sent out on the circuit and get back home reasonably quick, and you will get the benefit of it. You will not need a long time to get your members together, and it is better to follow that plan, to suit the time of your meeting to the itinerary of the speaker, rather than to have the speaker leave your vicinity and perhaps not be able to return again for some time, if at all.

I want to say something in closing about the responsibility of these men for carrying on this work, and if I forget to do it, I hope you will remind me of it. There is one thing I have always dreamed I wanted to do, and have not been able to get around to it—in fact, I am fifteen years behind my schedule. But here is one thing: Whenever you see a man, woman or child doing any form of manual labor you can be sure of this: There is some application of electricity that will either reduce that labor, reduce the strain on the worker, or contribute to his comfort.

Some day I want to go into some city where I have a live bunch of fellows and a good organization of a company section, and start out with the determination that we are going to study every form of human labor, and see how we can substitute electricity for it, or make electricity contribute to it in some way. It is a mighty interesting thing, and it is just as interesting as playing a game of cards, poker or what not, to figure how you will make electricity do the work of man. I get more fun out of it than any game of cards I ever played, or any other sort of game. You can see what a wonderful thing you will be doing for the public welfare and comfort in doing that.

I cannot lay too much stress, Mr. Chairman and gentlemen, on the question of the correct attitude of the public, especially toward corporations. You know there has been a general antagonism toward corporations in this country for a great many years, and it has been, to my thought, entirely without foundation.

I know that the corporation, as a whole, must inherently be more honest than the individual. Many men have to be identified with the affairs of a corporation; a corporation cannot be run by one man. Corporations must maintain records, and the highest type of honesty will be found in corporations. In the sweep of antagonism against corporations throughout the country we are the ones most likely to be reached and harmed, and we can go to greater ends in correcting this antagonism of the

public toward corporations than anyone else. This can be done best through our company sections, as members radiate throughout every part of the city life. They are close to the people in the city, and they can do more to change the sentiment toward the corporation than any other instrumentality of which I know.

I have no sympathy with the chronic kickers who are always saying unkind things about corporations, and sometimes these people are employed by the corporations. I generally converse with the street car conductor in a strange city when I am riding on the street car, and sometimes I say, "What kind of a company is this?" Perhaps he says, "They are a lot of rotters." I generally say, "Perhaps there is something wrong with you; I would have more pride, I would find a good, clean company to work for; but are you sure you are not working for one now?" I have not much respect for the man who works for a corporation he does not respect.

That is one of the things we should do with all of our men; we should make them respect the company, and if the company is wrong we should make it right and if the company is right the employe should understand it, unless he is one of those fellows imbued with the idea that he should live without working and in that case the thing to do is to get rid of him.

There is nothing that creates faith in the company like having the man who works for the company say the company is all right and honest and straight. If a company is conducted in that way—and most electrical companies are—it should have that tribute paid to it by its employes.

Just a word in closing. First, I thoroughly appreciate the words of commendation spoken by Mr. Eglin upon my work in the National Electric Light Association and, not as a matter of reciprocity, but as a matter of justice, I want to say that Mr. Eglin did more to bring about our present development of company section work than any other one man. I know of no man who has worked more earnestly and more unselfishly for the N. E. L. A. than Mr. Eglin.

The future of the company section depends on men like you in this room—you can make the National Electric Light Association as large and powerful as you want to, and you can, if you want to, make the company section a dominating element in the association. You can do it for the good of the companies,

you can do it for the good of the individual, and you can do it for the good of the public.

I wish I could get you men in this room into a frame of mind where you were determined to make the company section work stand out as a great contribution to everybody connected with the electrical business, and I mean by that every customer who is served, every stockholder and everybody having anything to do with the business—that means practically everybody in the community.

I thank you.

By working hard at the lodge a man may become an Esteemed Inner Guard, but the same amount of effort might make him a more efficient workman and place a few hundred extra dollars in his pay envelope.

—HENRY L. DOHERTY.

In direct contrast to other members of the public utility family, the majority of natural gas operators have not appreciated the meaning of "service" according to Mr. Doherty, after a visit to the natural gas fields of Kansas and Oklahoma. A feeling of antagonism existed, because the consumer of natural gas did not get any service.



HIS attitude on the part of the consumer is not unnatural, and to a great extent is justified. The average natural gas man puts gas into the mains and names a price that will sell the product, and which in nearly every instance is too low. When gas is abundant, all well and good, but with the coming of severe weather and a falling off of the gas supply, those consumers farthest away from the producing wells and on branch lines have their supply cut off, and take it pretty hard. The whole solution is limiting the consumption in accordance with the supply of gas available, and placing a price on the gas which will be inclusive of a service charge.

"In rendering this service the natural gas companies will be compelled to drill a number of additional wells, using only those

which will supply the demand, holding the remainder in reserve by mudding them. These reserve wells should be drawn on only when any of the regular wells fail to deliver, and at the utmost would not be in use more than 60 to 80 hours during the year. If such a program were followed I think the service charge would meet with very little opposition. People will pay for service no matter what it costs.

"The manner in which some manufacturers waste natural gas is criminal. Two causes are responsible for this condition: inefficiency of the appliance used and cheapness of the gas. A step in the right direction would be teaching the manufacturer conservation of the gas by a lessened consumption, brought about by more efficient appliances being used."

The older I grow, the more convinced I become that one of our greatest mistakes in the past has been to sacrifice too much for expediency instead of standing firmly for principles we know are right.

—HENRY L. DOHERTY.

An article from one of the large news feature syndicates had the following to say about Mr. Doherty:



AN aphorism from one of the country's most successful men, Henry L. Doherty, is this: "Think straight and clear. The man who is opinionated or ill tempered or prejudiced does not try to think straight, but seeks only evidence to bear out his already formed opinions."

A good many people imagine they have an "open mind" who in reality are eternally prejudiced. Arguments tending to bear out opinions they have formed are the only sort of arguments they will admit to their minds for consideration. Their egotism bars the way. They pretend to be broad, but in their hearts of hearts they believe they cannot be far wrong on any subject, and unconsciously they reject proof to the contrary.

As Mr. Doherty's success indicates, clear, straight thinking is essential for success in modern life. Narrow, self-centered

people don't get as far as they used to; the world has wised up too much. Folks don't believe all they are told, and egotists are always telling, by action or by word of mouth, of their greatness. Usually they waste so much time doing this that they haven't time for the effort required to make them broad-minded and able to look all around a proposition, and without this ability they are bound to go wrong sooner or later.

Both adversity and prosperity can make fools out of men. Prosperity makes more fools than adversity.

—HENRY L. DOHERTY.

The situation of the electric railways was desperate in 1918 and 1919. Confronted with tremendous increases in cost of operation and maintenance, ranging from 100 per cent to 600 per cent, many of them were restricted by franchises to a five-cent fare. Special legislation was required in most cases to get relief. The President appointed a Federal Electric Railways Commission, of which P. H. Gadsden of Philadelphia was chairman. Mr. Doherty was one of those called to testify before the commission, where he said:



RAISE of fare eventually results always in a raise in revenue, but if I were trying to state the effect of it I would prefer to make a fundamental analysis of it rather than to take the specific figures from some certain town and assume that that would apply elsewhere. Now you can divide your riding into two classes—necessity riding and non-necessity riding. If you are in a city where practically all your riding is necessity riding, where the rider has to ride, of course, a raise in fares will not bring any greatly diminished amount of riding. But if you are in a city where the distances are short, it will bring a diminished amount of riding, at least for the time being, and I think that depends largely on the temper of the people toward the road, whether they believe the rate is justified or not. What I expect to see is this: that a raise in rates will always cause mo-

mentarily a falling off in the number of passengers, but eventually, I believe, except in the smaller cities, the same number of people will ride.

Mr. Warren: And even immediately on the change there is some increase in revenue, is there not, unless it is an exceptional case?

Mr. Doherty: Unless it is an exceptional case, there is immediately an increase in revenue.

Mr. Warren: So that it is a real means of relief to the companies needing additional revenue?

Mr. Doherty: Yes, sir.

Mr. Warren: Are there any questions the commission would like to ask?

The Chairman: I would like to have Mr. Doherty go ahead and talk awhile. He has had a wide experience. Tell us what the trouble with the street car industry is and what is the remedy, if there is one.

Mr. Doherty: Mr. Chairman, I did not come down for this hearing, although I am intensely interested in it, and I am very glad that the street railway men are having an opportunity to tell their story.

In the early days of street railroading—and in a great deal of this I may be simply repeating what other witnesses have said—but in the early days of the street railway most of the roads were not to exceed two miles long and the platform labor cost not to exceed 15 cents an hour. I think in the city I was brought up in the maximum wage for a long time was \$1.80 and the hours were about twelve. Now we have seen wages gradually increase from 15 cents to a maximum of 60 cents and we have seen the distances increase from, say, two miles to, I believe in some cases, 15 or 20 miles, and the average distance of riding constantly going up on account of the size of the city. And it seems to me perfectly obvious that we can no longer stick to the original amount that was fixed for a street railway fare. That was fixed at that time largely as a matter of convenience on account of the nature of our coins.

In addition to that, we went through the bicycle craze and we saw the effect that had on the street railway companies, and now we have the automobile with us—apparently we have that with us permanently.

I do not know the answer to these problems. I would be perfectly willing to try to sit down and work them out with any group of men. There must be some answer, and if things are allowed to go the way they are I am sure that in the end, while the security holders and street railway men will suffer severely, it will be the public that will suffer the most, and it will be the wage earning class of the public that will be punished most, because they will have no other means of conveyance.

The public is always imbued with the idea in public service work that the thing they are the most interested in is low cost of service. It seems to me they are interested first in complete service from a geographic standpoint, second in good service, and, lastly, in low rates.

The only solution that I see to the difficulty is to raise the rates of fare to a point where the street railway companies can live; and until some scheme of premiumizing good management and economical operation can be devised—something like what is known as the London sliding scale—I do not see that there is any other way to work except on a cost-plus basis. I am a believer that, if we had the methods developed for doing it, we ought to go to a metered system of riding, paid for distance. But I think the paramount thing is immediately, before the credit of street railway companies is entirely wrecked in the minds of the investing public, to get some sort of relief for the street railways; and that, as I see it, can only be done by an increase in the rates of fare.

The Chairman: Could the problem be solved by getting away from fixed franchise rates and leaving it to the utility commissions to determine the reasonableness of a rate?

Mr. Doherty: Yes, if the utility commissions would act promptly it would, and I think utility commissions are in better shape to determine a rate than the local authorities.

I have had one case where we have been trying to settle the street railway difficulty for a number of years and we have had continuous negotiations, I would say, for nearly five years with the city authorities and have never reached a settlement, largely, I think, because the city authorities felt they had to comply with what they believed to be the wishes of the people; yet in many ways those conditions would have been something under which the company could not have lived.

In that case—I refer to Toledo—we took hold of the Toledo situation when it had been a matter of controversy for a long time and the people there were determined to have a 3-cent fare. A great number, perhaps a majority of the population, felt that if they voted for a 3-cent fare that such a vote should entitle them to a 3-cent fare—simply because they had voted for a 3-cent fare. They had that imbued in their minds, and when we would try to tell them we could not furnish street railway service at 3 cents, they would say, “We voted to have you do it.”

Now, we have never been able to make the local authorities believe that the people of the city understood that we must have a higher rate of fare; and yet I think the people as a whole know that we must have a higher rate of fare, and I think they would be willing to pay it.

In most every case if the matter was laid properly before the people, without any confusion from the other side, and was honestly presented from both sides, the people would be willing to pay the necessary amount to provide adequate and proper street railway service.

The Chairman: Well, of course, it is the law that a utility is entitled to a fair return on property which it uses in the public service. Now, if we can reach the time when the street railway properties are given an honest valuation by state regulating authorities or some others who have the power to say what that value is, and then a close examination is made of the operating sheet of the company, can you see that there would be any difficulty in having state commissions or other tribunals promptly determine the question of a rate increase?

Mr. Doherty: No, sir.

The Chairman: Has not the great trouble heretofore been that there is always a dispute as to the value of your property, as to the amount of the actual investment in the property, and a feeling that your property has been greatly overcapitalized, and because of that the investors are getting really more than they are entitled to?

Mr. Doherty: Well, there has been so much of a play made on the matter of watered stocks and capitalization in excess of cost that the public cannot dissociate that from the idea of a valuation made strictly on the property.

The Chairman: When you get a valuation, is not that in and of itself going to remove most of the difficulties which you have in dealing with the public?

Mr. Doherty: If you can make the public understand that the amount of bonds and stocks issued on these properties is not going to be considered at all in making the valuation of the property—the newspapers in the different cities generally play up the matter of watered stock, whether there has been any watered stock or not. But if you can make it plain that the property is going to be valued as a property and without regard to its capitalization, I think the public would be perfectly willing to pay a rate of fare that would in turn yield a fair rate of return of the actual value of the property. In the matter of the value of the property, I do not see that there should be such a great difference of opinion as there has been on some of the valuations.

The Chairman: Well, that is a matter of detail and does not go into the principle we are trying to discuss.

Mr. Doherty: No; I just want to make a point—that it is very easy to determine the value of the property.

The Chairman: I was back in St. Paul last winter, and the Twin Cities lines were trying to get some sort of legislation. The mayors of the cities and some others immediately took advantage of a public feeling that there were about \$10,000,000 or more of watered stock in the property, and that element alone, I think, had more to do with defeating really wise legislation than any other single factor. If those properties could have been properly valued by the state, subject to the right of appeal to the courts by either party, that element of criticism would have been removed.

Mr. Doherty: And I agree with you—if you can just get out of the public mind that that watered stock has anything to do with the valuation that is going to be made.

The Chairman: Exactly. Now, if the utilities and the public authorities can reach the point where these properties can be properly valued and you get away from a fixed franchise rate, have you not, as a matter of fact, got about all that a public service corporation should have?

Mr. Doherty: Well, that is all I think that any of the public-service corporations should ask for; but they are asking, if possible, that it really be granted to them very quickly.

The Chairman: Oh, I am asking questions now with reference to a permanent policy and not immediate relief.

Mr. Doherty: I agree with that policy until we can find some better one. If there is a better one, all right; but that is the only one I see now.

The Chairman: If you can reach this proper value and have the state fix the rates, is there any reason why you should adopt the cost-of-service plan? I am asking these questions and I am entirely open minded on the proposition.

Mr. Doherty: Is it not practically the same thing? Because——

The Chairman: No; because one operates automatically with the rise and fall of the cost of operation and the other addresses itself to the judgment of the tribunal.

Mr. Doherty: Well, I should think it would be preferable to have the state commission determine the valuation—I did not quite catch the distinction that you make between your plan and the cost-of-service plan. I should think——

The Chairman: I am not announcing a plan, but I am stating the plans.

Mr. Doherty: It seems to me the matter of being able to adjust yourself to new conditions without a new hearing is very valuable. Here is what happened, Mr. Elmquist, in the matter of public service commissions. If the day ever comes when the farmer must go to the public service commission or some agricultural commission and get the consent of that body to plant one field in wheat and another field in corn he will probably say, "Oh, well, it is so much trouble I will just let it go; I will not plant anything." Simply on account of the delay.

We have not been hurt so much by public utility commissions, even where they have shown their teeth in many cases, because we have been able to tell our story to them and get it before them. But we have often been intensely hurt by delay, and the street railway companies now are in a condition where they need assistance, and they need assistance at once. If they do not get it at once their credit is going to be permanently crippled. The whole industry's credit is going to be so crippled that I doubt if it can be re-established. I do not know that I make myself entirely clear. But if some man would go around to a farmer and say, "I am starving," and the farmer would say,

"Old fellow, I am going to have the finest crop of wheat next year you ever saw. You come around when that crop is in and I will give you something to eat." That would not do the starving man much good, because he would be dead when the crop came in. The street railways are in just such a crucial condition. In fact, their credit is already strained beyond the elastic limit, and when we talk about stopping and making an accurate valuation of these properties a very long period of time can be consumed. It is surprising how much time it does require sometimes in connection with a state commission making an accurate valuation.

The Chairman: I hope you did not get the idea that I meant there had to be a valuation of these properties in order to determine the immediate pressing question. You know——

Mr. Doherty: Well, I was afraid the conclusion would be drawn by many of our state commissions that no relief whatever should be granted until this very detailed determination of values could be made.

The Chairman: Well, of course, you know that state commissions during the war times have uniformly granted rate increases without going through the form of valuing the properties. They have simply overlooked that during the time of the war and have treated them as emergency propositions.

Mr. Doherty: They have in many cases, but in other cases they have not granted the increase; and my theory would be whatever is done to make an approximate valuation and make some rate adjustment on that basis and then later make the detailed and more accurate valuation.

The Chairman: Are we to understand that in your opinion this commission has just one duty to perform, and that is to evolve some plan for immediate relief to the utility?

Mr. Doherty: I did not assume that, but I do assume that if anything is going to be done and eventually serve the public properly with street railway service, there must be immediate relief given. In other words, that a permanent plan will be greatly handicapped unless immediate relief is given.

The Chairman: Well, might we assume then that there are two functions to be performed by this commission: One to evolve a plan for temporary relief and another to outline a plan for permanent relief?

Mr. Doherty: That would be very wise, I think.

The Chairman: Now, addressing yourself to the first proposition—of immediate relief—how can we serve the utilities in that respect?

Mr. Doherty: I would say by recommending that revaluations of the properties be made by approximate methods and rates predicated on the valuation by the approximate methods until such time as audit valuations of these properties can be made.

The Chairman: Do you mean that, where a utility is actually operating in the red and paying nothing at all to its stockholders, there should be a valuation of the property before relief is given, even upon an approximate basis?

Mr. Doherty: I do not think that is necessary. I will amend my answer by saying that in many cases there is no need of even making an approximate valuation. We know that a raise has to be made. But I should think an approximation should be made. I should think rates could be based better, even in a situation like that, if an approximation was made. Say, for instance, you just took roughly and said for a railroad, we will allow a valuation—I am just talking now in round figures—we will allow a valuation of \$100,000 a mile of track as an approximate valuation, and then we will see what the situation would have to be on that valuation to yield a proper return, and then these rates will prevail until an accurate valuation can be made.

The Chairman: Irrespective of value, the utility has got to have enough money out of its rates to pay its operating costs.

Mr. Doherty: Oh, yes; absolutely. But I would not like to see just enough given to them to pay operating expenses, because that does not save their credit and that does not save the credit of the business.

The Chairman: No doubt about that, but I was trying to develop the point that there are cases where valuation is not necessary.

Mr. Doherty: Certainly, in most cases valuation is not necessary to know that there has to be an increase in rates.

The Chairman: To whom should our recommendation be made and how, answering with respect to immediate relief?

Mr. Doherty: I do not know, of course. I am not a very quick thinker, but it seems to me we have got to make that

apparent to whoever the rate making body is. In many states both the city and the commission have to act, and having two bodies which must act makes it more than doubly difficult.

The one important thing to do here is to make the public understand it, because I know from my dealings with public officials that very often they know that a thing ought to be done, but they are not going to do it unless they believe the public thinks it ought to be done.

The Chairman: Do you believe the function of this commission, then, is largely educational?

Mr. Doherty: Yes, largely educational. I would say that the work of this commission would not be entirely covered if it simply succeeded in impressing upon the rate making body that this or that were so. Unless it can go further and be of enough public interest to make them courageous enough to act, not much will be accomplished from it.

The Chairman: Now to step from the temporary plan to a permanent plan; how can this commission serve the utilities and the public with respect to a permanent plan?

Mr. Doherty: It can point out the possibilities of street railway economies, and it can point out the possibilities of the relief from expenses that street railway companies should not bear. I do not know how many cities there are where there is an occupation tax laid on street railways. I do know that many public utilities are subjected to an occupation tax. And in talking with people responsible in some cases for levying that tax I find that they always look upon it as a tax upon the occupation of the street, not using the name of the tax in the way it originally started—as being the character of business carried on. Many gas and electric light and street railway companies are compelled to pay a tax for occupying the streets in some form or other. That is a very unwise policy, it seems to me, from the standpoint of the public. A gas or electric company transmits the equivalent of an enormous amount of energy over or under the public streets without noise, wear and tear, or causing the city the expense of maintaining the streets. A street railway company operates on its own steel tracks; it does not wear out the pavement, and to tell the truth, it saves a great deal of the city's pavement by the amount of trucking that is done on the street-railway tracks.

The Chairman: I assume we will have witnesses who will develop this part of the question more fully, but what I am trying to find out is if you cannot sketch out in a word the things this commission will do.

Mr. Doherty: I am trying to think of a few, but if you will allow me to proceed a moment—no occupation tax ought to be put on a street railway, because a car carries an average of thirty passengers, as compared with an automobile which carries two, yet we are subjected to a paving tax and it is not. There was a time we wore out the pavement; there was a time when the horses littered up the pavement and we had to clean it. We have lots of obligations forced on us now that are relics of the past, and we cannot get rid of them. I cannot think of all of them sitting here. But every possible relief which can be given to the street railways and transferred from a specific charge against them to either the property holders or the general fund should be given. Even if a man has an automobile and does not use the street railway, he wants it there—it is an asset there to him. It is there ready to serve the needs of his premises, with a messenger boy or anything else that comes along; and, in a way, you could almost justify a subsidy for a railway rather than have it shut down. Even if the people did not use it enough to pay for it, it would still be a municipal necessity. One of my first thoughts would be to take off every load that can possibly be taken off of the street railway company.

The Chairman: That involves a very comprehensive study of the chief function of a utility with reference to its service to the public.

Mr. Doherty: Yes; and it even involves the matter of the differentiation between a street railway company and another form of public utility, because there is a differentiation there.

The Chairman: Should this commission undertake to recommend a definite form of franchise to be used by utilities throughout the country?

Mr. Doherty: I would say no to that, because I assume we are not going to get away from regulation by some regulating body, and I think the franchise is more or less a superfluous thing, if you are going to have a regulating body. I do not think you can write into a franchise in advance as wisely as you can be regulated, and I take it that by no chance will regulation of the

public utilities be given up. If regulation is going to be maintained, it is a good deal better not to have any other instrument that interferes with regulation. Have your franchise just a permit to operate and have it of an indeterminate character and subject to regulation. I am just thinking out loud, because I did not know that question would be asked and have not thought of it.

The Chairman: Then you would be satisfied with a recommendation for an indefinite term franchise?

Mr. Doherty: Yes.

The Chairman: And have the utilities regulated by public authorities?

Mr. Doherty: I would, as a street railway man. I do not know as that represents the views of the other street railway men.

The Chairman: Then there is one kind of a franchise which you would be satisfied to have us recommend?

Mr. Doherty: Yes.

The Chairman: Are there any other features you would have incorporated in that franchise?

Mr. Doherty: Well, I do not know how to distinguish between what is in the franchise and what is in the law creating the regulatory body. If the duty of the regulatory body is to act and act promptly, I would say the less in the franchise the better. If you would start out today and get a franchise from the city, you would get what I have seen in my own case. They want to give you half a page as to the rights of the company and sixty-eight pages of restrictions on the company. That is what a franchise is today.

Mr. Warren: An attempt to regulate in advance for all time?

Mr. Doherty: Yes, an attempt to regulate in advance. Now, we are not asking to get away from state regulation, so if we are not asking to get away from state regulation and are going to have state regulation permanently, it seems to me it is better not to write a regulation in, in advance, at the time the franchise is granted.

The Chairman: Don't you think it would be well for a federal commission to make certain general recommendations to the states and to the municipal authorities that can be incorporated in new franchises as they are granted?

Mr. Doherty: There may be some things, but I do not think of them now. But I am very sure you could make one very valuable recommendation by saying, "Put very little in it."

Commissioner Sweet: If real relief is obtained through this commission or otherwise does it not, in your judgment, mean a rather complete revolution as compared with what has been; in other words, has there not been antagonism of a certain kind between the general public and the public-service corporations in the past. A feeling on the part of the public that the public-service corporations were grasping, were seeking to get more than they were fairly entitled to, and that it was the duty of the public to be very watchful and to do a great many things in the way of punishing the public-service corporations for what they might do?

Mr. Doherty: Well, you have described the attitude. I would use your same words in trying to answer your question.

Commissioner Sweet: Well, do you think that has been the situation?

Mr. Doherty: I think that has been the situation. I think there have been some grievances that the public have had, but I think they have been enormously over-agitated; and so many men have capitalized the little original unpopularity of the utility corporations to put themselves into political power and have kept at it that the public has felt that they had to be watched very close.

Commissioner Sweet: Is it not necessary to change that attitude entirely and wipe out this whole feeling to get permanent relief?

Mr. Doherty: You have to make the public understand that ordinary, common garden variety of fair play demands that the street railway company be given a fair and adequate rate of return, and it cannot do it with the old rate of fare, with all its expenses increased so enormously.

Commissioner Sweet: Now you are putting that solely as a street railway man and not as a citizen. Don't you think that instead of demanding it or recommending it, as far as this commission is concerned—as a matter of justice to the street railway company—that particular stress should be laid upon the fact that the public cannot have this absolute necessity, to say nothing about convenience, unless it changes its attitude and becomes

helpful and cooperative instead of having its tentacles out looking for trouble?

Mr. Doherty: Yes, sir; I agree with you thoroughly. But the only distinction at all between you and me is that I believe that sentiment would be largely removed if they did understand that these companies were really losing money. But you will find in every community some demagogue telling them that is all a bluff—the street railway company is not losing money—and that is one of the troubles. But I agree with you on another thing, Mr. Sweet, and very, very thoroughly. You took a slant at it, and I was hoping you would come out and say so. Let us assume we all do get wiped out; for every dollar we lose it will be nothing in comparison with the punishment inflicted upon the public.

Let us take our railroad situation. I saw the railroad situation made a toy of. I lived in Wisconsin, I was a young man there, and I tried to point out what was to be the effect of making the railroads of this country a political football. But, on the plea of saving money for the wage earners, they kept reducing fares and regulating and regulating. Now the wage earners are not great travelers. And I maintain this, and this is conservative, that for every penny that was saved the wage earners of this country by a reduction of fares and regulation of railroads it cost those people at least 10 cents in the way of increased food, increased cost of clothing and increased cost of sheltering and housing them, because we were a rapidly growing country; we had more mouths to feed and more bodies to clothe and shelter and were not opening up more land to take care of them. Now in the end it was the public that paid the bill. The railroad companies paid first, but the big bill was paid by the public. And how much it cost the public after we got into the war I do not know, but if it had not been for the development of the automobile and substitution of gasoline for horsepower I do not know how we would have fed ourselves and our allies. We could not have done it. And that is just what foolish regulation costs, and always does—regulation that is done for the political advancement of the men who promote it. It would have cost us the loss of the war if it had not been for the development of gasoline consuming devices instead of food consuming animals.

Commissioner Sweet: Well, that is a little bit aside from the immediate question, but as a matter of fact—

Mr. Doherty: Well, it is a public utility, and we are going the same way with the public utilities, and the public will pay the big bill in the future.

Commissioner Sweet: But the internal combustion engine has really played a big part in this war.

Mr. Doherty: Yes, and in hurting the street railways; and it did not save us on the fare question.

Commissioner Sweet: Certainly, but we would have no aeroplanes if it was not for that kind of an engine.

Mr. Doherty: No.

Commissioner Sweet: And no dirigible balloon.

Mr. Doherty: Well, we might have the balloon, but not the lighter-than-air machine. But it was the substitution of gasoline, a mineral product, for a food product, that enabled the existing lands to feed ourselves and our allies.

Commissioner Sweet: Now, to come back to the main question—

Mr. Doherty: In other words, it is a mere accident that the matter of trying to capitalize railroad unpopularity for political advancement did not ruin us.

Commissioner Sweet: Now the real point is to get away from that prejudice which we all realize does exist to a certain extent and that there was some ground for in the past a great deal more than there is at present; in fact, the evidence so far introduced seems to be that there is little, if any, ground for it now, and yet we all recognize its existence to a certain extent. How to get rid of it is the real problem, is it not?

Mr. Doherty: I think so. But I think the real way to get rid of it is to convince the public—that is, I think the people will change their attitude of unfriendliness if they thoroughly appreciate that the roads are losing money and that they must be supported, because this is a public necessity. It is not a matter of something alone purely for the benefit of the stockholders. The people must have it, and it is more essential to them than it is to the stockholders.

Commissioner Sweet: Then would it be your opinion that if this commission, by reason of all the investigation that it is capable of making within a comparatively short time, should report that the interest of the public, in its judgment, demands first the immediate relief that you have referred to and later on more

permanent methods of relief, to say comparatively little about the interests of the companies, although that means, however, the interest of investors, who are a part of the public—often widows and orphans and a comparatively few people——

Mr. Doherty: Yes, and some of them savings banks and life-insurance companies.

Commissioner Sweet: Well, if the whole subject were presented to the public just exactly as it is and in a comparatively brief and forceful manner, backed up by what little authority there may be given to this commission in the minds of the public, do you think it would do some good?

Mr. Doherty: Oh, yes; it will do a great deal of good, and I do not believe that you men can sit and listen and examine every part of this case without, when you get through, being able to say honestly that it is more to the interest of the public to do this and to do it promptly than it is to the railroads or to the investors.

Commissioner Sweet: Well, it certainly seems as if the public ought then to be open minded enough to realize that fact.

Mr. Doherty: It depends how many newspapers are preaching the other side as a pure matter of selfish interest and how many people have already started out to capitalize their own political future on this particular issue and who cannot very well back up.

Commissioner Sweet: Why should newspapers have any interest in taking an opposite view?

Mr. Doherty: Well, lots of newspapers have built up their circulation by simply preying on the public utilities, thinking that that would be a matter of interest that would sell their newspapers.

I have been in the public utility business—this coming fall, if I wanted to, I could celebrate my thirty-eighth year in the public utility business. I have seen case after case of trouble hatched up between a city and a public utility company that was done purely for political reasons. I could name you case after case where public councilmen or people of that sort would make a demand on the public utility where they would have been the most disappointed people in the world if the company had met the demand—in many cases they were. And I could cite you other cases where the public utility met the demand for a reduction in rates and immediately some demand was made that the

company could not meet. Then the politicians would have an issue they could go to the people with—they would promise them cheap gas or cheap current, saying they would get it for them if they would put them in office.

Now you have that to meet. An average reformer is a man, to my mind—in my time I have met a great many of them—and I would describe him, as a rule, as a man who was willing to take everyone of the great big human problems and use them as brickbats or use them as a pedestal by which he could get his shoulders above the balance of the crowd. Of course, many of them are genuine, but they are shallow thinkers—they are always going to tell you. I always measure a reformer, as to whether he is a real reformer or not, by whether he is willing to give the people something out of his own pocket or out of somebody else's pocket, and I do not see very many that are. They are generally looking for a good fat job.

The Chairman: If your definition of a reformer is accurate, then does it not mean that all reforms that have been accomplished for the benefit of civilization have been made to meet the selfish wishes of those who advocated them?

Mr. Doherty: Well, I will tell you. There are a lot of things you would call reforms probably that I would not.

Commissioner Sweet: The reformer you have been talking about is the spurious reformer, the man who is trying to trade on the principles of being a reformer and is not really one.

Mr. Doherty: Yes, but just think how many of those we have with us.

Commissioner Sweet: Yes, I understand.

Mr. Doherty: They kind of crowd out all the rest.

Commissioner Sweet: For one real reformer there are probably fifteen or twenty or maybe fifty of these so-called reformers who are not in reality such. Is that it?

Mr. Doherty: I think your figure is a little low there. I would say 100 or 200.

Commissioner Sweet: I presume we will all of us agree in rather despising those who sail under false colors of any kind.

Mr. Doherty: Well, I do not know as I do. I have a lot of sympathy with many of these public officers. You know that the people right down here in the Senate and House cannot vote as they really think. I took lunch today with a Senator at the

Senate lunch room. He said, of course, they cannot do it—they are such big cowards they cannot do it. If they just did what they thought was really right they would never serve but one term, and they would not serve that one term out if the recall could be sprung on them.

Mr. Warren: I believe they could vote what they really believe and stay there, but they do not think so.

Mr. Doherty: I do too. I think the public admire bold people. I think that is the reason Theodore Roosevelt was such a hero, because he had the nerve to tell the public where they could get off, and they liked it, but the average politician does not.

I went to a city official and said, "Are you going to allow a think like this to be pulled?" He said, "What can I do? If I don't permit this thing to go through, people would say you had bought me out." It was a case of two opposition companies fighting. There was a man as honest as the day was long, but he felt he could not stand up and do what he knew was right, because it meant that sort of criticism.

Commissioner Sweet: I am going to turn the tables on you a little bit.

Mr. Doherty: That is fair enough.

Commissioner Sweet: I know of a case where a public service corporation attempted to induce the appointing authority of a city to appoint a man on the board of assessors who had been a member of the common council and had been recognized all over the city as a very decided friend of public service corporations. The appointment was not made. I know of another case where a public service corporation attempted to induce a public official who had the appointive power to appoint as chairman of a franchise committee of the common council a decided friend of such corporations, and especially desired to have left off from that committee entirely a man who had shown himself somewhat advanced and a little too anxious to require street railway companies to put down what is called the Trilby rail. And I could name a number of other instances of that kind that never got into the newspapers at all.

Mr. Doherty: Don't think that I am sitting here and claiming that the only virtue in the world belongs to corporation men. I do not. But I do say this, that the greatest degree of honesty that

you will find in the United States you will find among the big business men of this country. And there is a reason for it, and it is a natural reason: Big business requires a certain amount of mutual trust every place. You do not advance men there who are thieves. Thieves have to work in squads of one; they have to watch each other. It is natural that business carried on with corporations should bring about the advancement of the men who are honest and trustworthy. I am not here pinning any particular stars on them; that is, I am not claiming that the corporation men have done no wrong. But I would say there are certainly no more honest men in this country than corporation men. Unfortunately, they are badged wrong. If you go to Europe you will find everybody tells you, "Look out for the American business man." I say to you after doing business with most of the men in the European countries there is no man as honest as the American business man, and yet he allows himself to be badged as the dishonest business man, on account of a few of our fakers who have gone over there and put things over on them. The corporation man, for not having defended his reputation, has been made to appear in the eyes of a great many people in America a little more dishonest than the average. They view it as being unfair when we try to get somebody put on a board who we know will be fair. We are not supposed to do that. They can go out and preach that as far as they want to. But the average corporation in this country is not looking for anything but a fair deal and they will be glad if they get that. They just want the common, ordinary garden variety of fair play. They will be satisfied with that, and it is that or ruination in some cases.

Commissioner Sweet: Let me say this, to close the matter up, and I think you will agree with me, that with many business men, big or little, there are some who are honest and men that you can admire from every point of view, and others who are not. You will find the same thing among newspapers and newspaper men. I think you will find the same thing among city officials; you will find some who are strictly honest and square and serving the city faithfully for compensation far below what is actually earned. You know that is a fact in many cases, do you not?

Mr. Doherty: Yes.

Commissioner Sweet: And there are dishonest ones. Men have been shown, many city officials, to have accepted bribes and

business men have been known to give men bribes on school boards and common councils. Now these things all occur. We have got to admit it, and it is not fair nor is it wise for us to generalize too much and say that one type of man or people engaged in one kind of business are all right and nobody else is. The facts do not substantiate or sustain any such proposition as that. When we come right down to the point before us is not this the situation: That whatever may be said about public service corporations or public officers or the general public or newspapers, that the points of antagonism that existed a few years ago have disappeared and that now the interests of the corporation, both public, private, and the general public and the newspapers for that matter, because the newspapers are supported by the general public and ought to be carried on in the interest of the public, and for that matter the interest of the politicians who used to trade to some extent in getting up on the house tops and decrying the public service corporations. But the interests of all, if properly understood, are distinctly in favor of cooperation hereafter instead of opposition and of resorting to some method by which the general public shall not be deprived of the necessity of railroads; and that the holders of bonds and stock as well, for instance, shall not be deprived of a reasonable income, and that some steps shall be taken, if it is possible to find out what ought to be taken, to adjust this matter in a proper cooperative manner for the general benefit of all rather than in a spirit of opposition such as has existed before. Is not that true?

Mr. Doherty: Yes, sir; that is true.

Commissioner Sweet: Now, then, if that can be brought about we may say that it will be bringing about the millennium, but it is not absolutely impossible that an approximation of that may be reached, is it?

Mr. Doherty: I do not think it is so difficult either.

Commissioner Sweet: It ought not to be, because it is a mere question of knowledge and knowing what the facts are, is it not?

Mr. Doherty: It seems to me obvious that the relief must be given.

The greatest assets the world possesses are its great minds. When a great mind goes, the world is poorer.

—HENRY L. DOHERTY.

Mr. Doherty's views on the electric light, power and railway situation in 1919 made such a profound impression that he was asked to talk on "What the Gas Business Needs," at the annual meeting of the American Gas Association that year. He said:



HIS title was chosen by somebody else and assigned to me and is not of my own selection, but is a text that I am glad to talk upon.

First of all we need a strong, representative and democratic association. When I say strong, I mean that it should have an abundance of funds and should have the earnest cooperation of the industry; when I say it should be representative I mean that it should have not only support by membership, but the benefit of the work of the men who are the best skilled and most active; and when I say that it should be democratic, I mean that everybody connected with the industry should feel that he has an equal welcome to, and an equal voice in the management of the association. When I say it should be representative, I also mean particularly that the men who sit on the board of directors, also those who direct the activities of the association by doing section and committee work, should be representative in the sense that they are also to vote according to their own convictions and according to the information which is laid before them.

It is disheartening to serve on a board of directors or a committee where some of the members have had their instructions before they left their home offices as to what they should vote for. Generally speaking, it is difficult to be free from a certain amount of restrictions by instructions from the home office unless the directors and others deciding the policies for the association are in every case the absolute heads of the organization they represent, and I think, so far as possible, we should endeavor to enlist the active heads of all of the different corporate entities in the gas business and so far as possible keep them interested in our work. The man representing the smallest gas company in the United States as the head of that company is often more free to cast an independent and intelligent vote than the man who is only one of many representatives of a large organization which has set policies of its own. I do not mean by this that in every case the work of the association must

be carried out by the heads of these different companies, but we must have the work of the association carried on by men who are untrammelled by home instructions. It is maddening to try to do business with a fellow director or a fellow committeeman who must vote according to the instructions he received before he left his home company regardless of the arguments that are put before him. A rubber stamp or a phonograph would be equally helpful to our deliberations as a man who is forced to carry out instructions. If the absolute heads of our different member companies are unwilling to show sufficient interest in our association affairs by serving on our boards and committees and by attending our conventions, then we should make sure that the man the boss sends to us is untrammelled by home instructions or else look for other men to direct the association affairs.

None of the organizations that I am acquainted with is organized and conducted along lines as democratic as I would like to see. We all know the baneful influence of paternalism in our Government activities, and yet we are the first ones to adopt paternalistic methods in our association work. We generally have a board of directors that meets a few times each year and devotes only a few hours' time to the work, and yet we are tied hand and foot in everything we would like to do, except as we can get the consent of that board. Our past boards of directors seldom gave enough time to their work to be able to pass on any important matter that might come before them, and this led to restriction and a repression of proper association activities. Our present board of directors, I think, is the most representative board we have ever had, and it is a great pleasure for me to pay a tribute to the members of that board for the frequency of their meetings and the earnestness of their work. This part of our association work we should maintain. We should also prevent any men or group of men from usurping any particular function of the work that is being done and dominating it to the point of restricting the active interest or enthusiasm of others. Instead of making it necessary to get the consent of the board of directors to create special sections, this matter should be mandatory, provided such sections are petitioned for by a good number of the company members. This idea of having a technical section, or a commercial section, or an accounting section, which assumes to dominate the entire

field to the exclusion of what any other group of men want to do is, in my opinion, a mistake. Any activity which can spring up beyond the membership of the association should be able to spring up automatically within the association. Some of the advertising men wanted to form a special section during the past year. This was opposed in some quarters. I am heartily of the opinion that an independent section of advertising men can do much more good than to simply have it as a part of the commercial section, and I am also satisfied that if the chemists wanted to form a separate section they would do vastly more and better work than if they were simply made a portion of the technical section.

I meant to study very carefully our present constitution and by-laws before this convention met and to make specific recommendations, but time did not permit me to do this. I notice that companies of a certain magnitude are getting a reduction of dues from one-thirtieth to one-fiftieth of 1 per cent of all business above a certain amount. While I happen to be one of those who would have to pay a larger amount by removing this clause for a reduction, I am, nevertheless, in favor of doing this in the interest of greater democracy. When we make a fixed charge plus a percentage it does, in my opinion, work out with sufficient equality, so that a further reduction to the large company is not necessary.

In our association work we should endeavor to stimulate an interest which will insure the best work and the best papers from the entire industry. We must continually keep in mind that the association should do that work which is of most importance to the industry and of most benefit to the public, and that it is not simply a technical society or a commercial society, and that it covers every feature of active interest, both to the gas company and the public, such as relations with the public and public officials, finance and rational governmental regulations, and to keep these regulations within the limits of necessity. Don't forget this, that we can't do everything and, therefore, we must always be sure *to do that thing which is of most importance to the industry.*

Now as to the business itself. I look with great optimism on the future of the gas business, provided we can stimulate our own people to active work along rational lines. My optimism, however, depends entirely upon the people of the gas business

realizing the changes that have taken place in our lives and methods since the time of Murdoch. I am glad to pay a tribute to the wonderful men identified with the gas business in its early history, but I am quite sure that with the ability they showed at that time to adapt themselves to the conditions of their time they would show a greater ability to adapt themselves to the conditions of our time than we ourselves have shown. We must have rational standards that fit our present time and not be tied down to the standards which were made in the days when gas was used only for lighting and used in open burners. Such gas as we do sell is now sold for a different purpose and under vastly different conditions. The future of the gas business depends upon substituting gas for solid fuel. We need men with the vision of the prophets rather than men who simply know the history of the gas business. The standards under which we now work are absurd, unnecessary and a relic of a by-gone day. I doubt if any gas company today sells more than 4 per cent of its gas for use in open flame burners, and it is ridiculous to enrich gas with hydrocarbons at great expense so that 40 feet out of every thousand can be used in the most wasteful way to produce light. The public itself would be benefited if we serve a nonluminous gas, for this would force an economical method of using the gas on the part of the unthrifty. After having been a producer of gas for a great many years, I am now a large producer of oil, and if I were to advocate what would best serve my business interests I, of course, would advocate high B. t. u. standards and high candlepower standards just to insure a market for oil, but I hold that both are unnecessary and are generally a waste of good material. I will go further than this and say that I seriously doubt whether the ideal gas will contain any hydrocarbons whatever. Here is a question that I would like to interest the gas fraternity in solving. *What is the most desirable gas to serve from a customer's standpoint?* There is absolutely no reason for fixing on a gas of approximately 600 B. t. u. per cubic foot. There is no elemental gas of such a relation between density and heating value. The only reason for such a standard is because by our present methods of carbonization a good quality of gas coal tends to produce a mixture of elemental gases having a value of approximately 600 B. t. u. The consumer is no better off with one cubic foot of a 600 B. t. u. gas than he

would be with two cubic feet of a 300 B. t. u. gas, and, given a proper interest in the development of appliances, I am inclined to believe that far better results would be gotten from 300 B. t. u. gas.

For some reason it always seemed revolutionary to gas men to talk about serving a non-luminous gas and especially to talk about a gas containing no hydrocarbons. I know that in some of my work in trying to make progress in the gas business I spent a great deal of time and money on the possibility of producing on a commercial scale marsh gas from carbon monoxide and hydrogen. At the time I was working on this problem I became convinced that I could serve not only a cheaper gas but also a better gas when considered in the aspect of all of its uses if it contained no hydrocarbons. This, however, is a problem that I would like to see broadly considered and discussed. If we ever develop the gas business to a higher degree of efficiency I am inclined to think that even with room heaters we will find that the greatest efficiency will be secured by the use of recuperators and that practically all of our industrial appliances will be equipped with either recuperators or regenerators. Hydrocarbons are objectionable on account of breaking down during the preheating process and either depositing carbon in the regenerators or elsewhere.

I am rather of the opinion at this stage of my investigation that the most satisfactory gas of that which we now have would be a blue water gas, except for its large content of carbon monoxide. I am quite sure, however, that a gas running largely hydrogen gas would prove a very satisfactory gas and a much more satisfactory gas than the public now gets. There seems to be a universal belief that the quality of the gas is fixed by what I might term its B. t. u. density, or, stating it in other words, that gas having the greatest number of B. t. u. per cubic foot is the best gas. This is far from true. Marsh gas, having about 1,000 B. t. u. per cubic foot, has a much lower flame temperature than either hydrogen or carbon monoxide, although these gases run in the neighborhood of 300 B. t. u. per cubic foot. Marsh gas also has such a low rate of flame propagation that it cannot be used for some purposes. For instance, marsh gas cannot be used in a blow pipe. If we take 16 pounds of marsh gas containing 4 pounds of hydrogen and 12 pounds of carbon, it would

only produce in combustion about 90 per cent as many B. t. u. as if we were to burn 4 pounds of hydrogen gas and 12 pounds of solid carbon. The lesser amount of heat by the burning of the marsh gas is due to the heat required to dissociate the CH_4 molecule. The only place where marsh gas is more desirable than, for instance, a blue water gas is for use in an internal combustion engine, where the Otto or some other similar cycle is used, and the gas and air are mixed with each other during the compression stroke. Marsh gas permits of a very heavy compression, while the gas containing a large amount of hydrogen will premature at heavy compression, and the secret of efficiency of gas engine work is to use heavy compression. The question of what is the best gas to serve to the public for the benefit of the public is well worth the attention of the gas business.

In the earlier days of the gas business we saw a number of attempts made to furnish fuel gas. In some instances these attempts were made by men who neither knew their chemistry, their physics or their economics. No matter how efficient our gas making processes may become, and no matter how inexpensive the necessary manufacturing apparatus may become, it will never be possible to substitute gas generally for solid fuel and sell gas at a fixed price per thousand cubic feet. Some gas consumers would lose money for you at \$10 per thousand cubic feet, while other gas consumers might yield you a handsome profit at 50 cents a thousand cubic feet. Our expenses are not in proportion to the amount of gas consumed. Our expenses are fixed by the number of customers we serve and by the maximum rate of demand made by those customers. I have never seen the slightest reason to change from the opinions I have expressed in our old gas conventions regarding the correct method of selling gas. I think we must adopt the "readiness-to-serve" method and apply it universally to all consumers. The interests I represent are proposing now to serve the customers on the line of the Kansas Natural Gas Company, the Wichita Natural Gas Company and the Quapaw Gas Company with gas at these rates:

For natural gas:

An annual customers charge of \$6 plus

An annual demand charge of 32 cents per cubic foot per hour plus

A gas charge of 30 cents per thousand cubic feet.

The customer can contract for whatever demand he wishes to use, and is to be limited to this demand by an automatic device, which we have developed. That is, if the customer pays for a 50 foot demand, his meter will be equipped with a demand regulator and that will only permit 50 feet to pass. For instance, under the new method of charging a customer using 150,000 feet of gas for cooking and heating his home and requiring a demand of 100 cubic feet per hour would pay

Customers charge	\$6.00
Demand charge	32.00
Gas charge (150,000 feet at 30 cents)	45.00

Total	\$85.00
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making an average cost of gas to him of 55.3 cents.

We propose to supplement natural with artificial gas, as the natural gas fails, and we have agreed to sell this gas on a basis of

An annual customers charge of \$6 plus

An annual demand charge of 50 cents per cubic foot plus

A gas charge of 40 cents per thousand cubic feet.

In this case a cubic foot of gas shall be 1,000 B. t. u., or in the event that 500 B. t. u. gas is supplied, then the company will have to supply two cubic feet to count as one cubic foot.

To avoid the complication of talking cubic feet and thousands or millions of B. t. u., I suggest the adoption of 1,000 B. t. u. to be known as a gas unit, and then we can use this term to express whatever quantities of gas of varying calorific value and mean the same thing. The price on the artificial gas in the proposition outlined above is based on coal at \$3 per ton, and is to be advanced or lowered according to the cost of fuel.

A complete bibliography on the rate question will be found beginning on page 380, Volume 1, American Gas Institute Proceedings, 1906. Anybody wishing to look up my specific views on the rate question can get a paper I read before the National Electric Light Association in May, 1906, at the Chicago convention entitled, "Equitable, Uniform and Competitive Rates," and for the reasons why it should be applied to the gas business they can also get a reprint of my testimony before the Kansas Public Utility Commission, which was printed by the commission and circulated among the interested parties in Kansas.

The ever increasing demand for natural gas by the growth of the population is bringing about an extreme stringency.

almost throughout the entire country, of the necessary natural gas supply. All of the natural gas companies will have to sooner or later supplement their natural gas supply with artificial gas or curtail their demand.

To curtail the demand for natural gas is not as easy a matter as it would at first seem to be. It has been demonstrated, and especially at Kansas City, that there is no practical method of curtailing the demand except by increasing the price. If gas is being sold solely on a per thousand cubic foot basis it would probably be impossible to curtail by price, so that the demand would be well within the supply, without bringing about such a heavy curtailment in consumption as to bring the demand far below the supply.

The demand for gas and the consumption of gas is not inversely proportional to the price, and demand and consumption are not synonymous and can vary greatly in their relationship to each other. In raising the price you cross critical points where gas no longer can compete economically with other fuels for certain uses. A rise in the price of natural gas beyond some of these critical points can work the seeming paradox of bringing into the company less gross and net earnings at a higher price than at a lower price. Each rise in price by curtailing some consumption automatically forces a still further rise in price, and it will probably be found that as the price of natural gas is advanced and the critical lines of competition are crossed the price of natural gas will have to go at a price to the consumer approximating that of artificial gas.

There is another reason why natural gas will have to be supplemented by artificial gas, and that is, because as the natural gas supply becomes diminished to a great degree and insufficient even for furnishing the gas needed for lighting and cooking, then the supply must be abandoned and artificial gas supplied for the complete demand, or else the natural gas supply must be supplemented with an artificial gas supply. In other words, I see no way to milk the last quantities of natural gas in the various fields from the ground except by supplementing the natural gas supply with an artificial gas supply.

It is to be regretted that when natural gas was introduced as a domestic fuel in this country the foundation was not laid for a continued supply of fuel gas of either natural or arti-

ficial gas. For instance, we know that customers will gladly pay as much as \$1.50 to \$2.00 per thousand cubic feet for artificial gas for cooking. With gas at \$1.00 per thousand cubic feet, they are willing to pay on an average, we will say, \$25.00 a year. When natural gas is brought to a city as a substitute for artificial gas and sold, we will say, for 30 cents per thousand, it is possible for the gas consumer to substitute 15,000 feet of natural gas for the 25,000 cubic feet of artificial gas he has been using, but instead of paying \$25.00 for it, he pays \$4.30, a price which is manifestly so small that it would not pay even for taking care of the accounts of the different customers.

There are two fundamental natural laws which must fix the price of commodities and of service. The minimum price must always be in excess of the cost of furnishing the service, otherwise the service cannot be permanently furnished. The maximum cost must always be less than the value of the commodity or service to the user, otherwise the user will sooner or later substitute something else. While we could justify—as being for the best interest of the public—a different price for the use of gas for different purposes, yet it is not necessary for us to do this if we use a rational system of charging. We can, however, measure the results that we might get if we were to say to a gas consumer: If you will agree to buy 25,000 feet of gas at \$1.00 per thousand, we will then allow you to have an additional supply of gas for other purposes at 50 cents per thousand. Such a rate would stimulate gas consumption far greater than to quote a uniform rate of a weighted intermediate value. By the stimulation of a greater consumption the unit cost for gas would be reduced, and the public as a whole would be served at a lower average rate.

The readiness-to-serve rate will accomplish this same result to a still greater degree and can be entirely justified on the ground of expenses caused to the company and no distinction need be made in the purposes for which the gas is used. I am convinced that it is entirely possible to substitute gas very generally for solid fuel.

Picture in your own mind the magnitude and prosperity of the gas business if this could be done and contrast it with whatever future you see in your own mind for the gas business under present conditions.

This is not an idle dream, but even if it were, the gas business would be immensely helped by dreaming some along these lines. To accomplish this we must be able to get out of our ruts and create our own reforms. It is a common saying that "nothing is ever reformed from the inside but reforms must come from the outside." There is much truth in this. I have tried for a number of years to work out several reforms in the public utility business. I have always found that my greatest opposition came from the men in the business. In the gas business I have tried to get away from a standard of illumination and a fixed heating standard for a given unit of volume. Coal gas is now sent out to the mains containing hydrocarbons having considerable value for many other different purposes, and which to the gas customer are of no more value than a like amount of non-luminous gas. In making carbureted water gas we must supply in our manufacturing process valuable hydrocarbons that are either not needed at all or else are not needed to the extent required by our present standards.

There was a time when my credit in this country was not as good with the men who then happened to control the destinies of the gas business as it was with many of the prominent gas men of England and Germany. It occurred to me that if I could get a reform in standards in England I could easily accomplish the matter here because while America has led the world in almost every other line of endeavor we have in the gas business slavishly followed the traditions and developments of England and Germany. I recall nothing of an evolutionary or revolutionary character that we have done except the work of Lowe, whose reward was an over-generous amount of criticism and very little in the way of appreciation.

While we have accepted as a standard the German and English results I cannot feel that their results have ever been within hailing distance of the results developed in this country in other lines of work. At the same time of the threatened shortage of motor fuel and when France and England were offering huge rewards to anybody who would find a substitute for gasoline, I proposed to the motor industry of these countries that they advocate the removal of the light oils from town gas and use them as motor fuel. This was in 1911. In 1913 at the request of people interested in the automobile industry I started

a campaign in England which was intended to secure the necessary legislation to permit this to be done. At that time if all the gas sold in Great Britain had been manufactured from coal and all the light oils had been extracted for motor fuel Great Britain would not have been compelled to import a single gallon of gasoline. I am very sure this campaign could have been successfully put over if it had not been for the opposition of the gas men themselves. I also showed how vehicles like buses with a fixed route could use town gas instead of gasoline by having stations along the route where gas could be charged to the vehicle under pressure. My campaign was very favorably received almost every place except by the gas men themselves and the people they could stir up to oppose it, and much of the opposition took the form of ridicule and statements which were not true. War necessity demonstrated the possibilities and the correctness of the picture I then drew. I submitted a paper on this subject to the British Institution of Gas Engineering but it was rejected.

If we are going to realize the possibilities that unquestionably do exist in the gas business we must overcome the intolerant opposition of the standpatter. I plead guilty to having said on more than one occasion that what the gas business needed most was a few first class funerals. I am sorry I said that and I did not mean it that way. What I should have said was that the gas business would be immensely benefited if we could send a lot of our gas men who assume to speak for the industry off as Government Ambassadors to foreign countries. Some of the men I like the most in the gas business are, in my opinion, serious brakes on the wheels of progress. They oppose any change for fear a willingness to make changes might subject us to changes proposed by impractical reformers, and they are partially justified in this. No man having property which the courts can seize for any damage he does, will willingly go into partnership with a bull in trying to catch a mouse in a china shop. But changes and reformers are necessary and we certainly never can have them unless we are willing to at least talk them over among ourselves. We must be prepared to again review the present needs and demands for gas and to throw away if necessary even appliances such as the Bunsen burner, which perhaps no man in this room has ever looked upon as anything but a

great benefit to the gas business, and yet I am not sure but what if the Bunsen burner had not been used the gas business might not have been better off. It is a haphazard way of mixing the gas and air and has in many instances limited our opportunities to substitute gas in competition with other fuels. If the Bunsen burner is to be used universally as it is now, it is a very easy matter to demonstrate to the public that the lower the B. t. u. standard in the gas the better the results secured per million B. t. u.'s. When you stop to think that your gas is acting as the motive power for drawing in the air and mixing it with the gas it is a very simple thing to see how this can be done more satisfactorily and more properly the larger the quantity of gas in relation to the air. In fact, the average gas man is ready now to swear that a lowering of the B. t. u.'s is actually beneficial to the gas customer. This is one of the many places where you can see the tendency of gas people to be superficial in their conclusions. I think if any one of the men who really believes this will carefully adjust the burners for each kind of gas and do a given amount of work with it they will find that for all purposes where gas is used for low temperature work the results are just proportional to the B. t. u.'s furnished.

In my opinion there has never been a time when we could not have carried gas from a coal mine to a city more economically and reliably as a power proposition together with its use as a fuel, than can be done with an electric transmission line, yet with all of the handicaps that the electrical engineers had, with the difficulties of making a reliable electric transmission system, we have done nothing of this sort, and the electrical men have made what seemed at first almost impossible in actual practical results, a very successful affair.

The trouble with the gas business has been that it is still suffering from its once world wide prosperity. I do not feel that we have even availed ourselves of the discoveries made by others in physics, chemistry and economics.

Let us take another example of some of the possibilities in the gas business which we might avail ourselves of. Prior to the war automobile engines could be purchased at less than \$2.50 per horsepower. While it is true that we have never found an automobile engine that will stand up over an extended period of use at full load, yet to have rebuilt that engine so it would

stand continuous hard use would not have been such a very expensive matter. The engines used for motor boats have to stand a long hard usage at maximum load, and this would be true of the tractor. I think it entirely possible to assume that by working with the tractor industry we can have a standard gas engine for our lines having powers at least up to 100 horsepower and at a cost very much less than \$20 per horsepower. If we will stop trying to carry at least two-thirds of all of our customers at a loss and give to every customer his service according to the cost he occasions our company, the amount of business we could do with a rational system of charging and with a low price gas engine would be enormous.

I can see even a possibility of the existing gas companies putting in plants for the supply of oxygen and distributing it to the closely settled manufacturing districts. These things can more easily be done if they are first discussed at our gas conventions. This matter of supplying not only gas but the oxygen in a concentrated form to burn it may seem far fetched to many of you but if it were not for the unwarranted lengthening out of this paper I would show you what a large demand has sprung up for oxygen in the last few years and what an enormous margin there is between the cost of oxygen to the manufacturing plant and its cost to supply it in this way, and I would also like to make some figures to show you what the field of oxygen consumption would be if supplied at a low cost. This is only one of several legitimate extensions to the gas business which I can foresee.

We have done some work on the matter of finding some extremely odorous substance that we could add to our gas and which would burn to inodorous compounds. In event of success we felt it would be desirable to create a standard character of odor for gas and of a standard intensity. This work was soon given the name of Standard Stink and I think that common and perhaps somewhat offensive word is more in accord with the practical methods of the day. We found that the Bureau of Mines were making a study of "Stinks" for another purpose and we are now awaiting the results of their work. A universal character of smell and of uniform intensity would, we think, be desirable for many reasons. Our smelling faculties require education. If you take natural gas to a city that has never had it

before, the people say at first that it has no odor, but they soon learn its odor and can detect it almost as quickly as they can detect artificial gas. If there was some very decided and universal odor for all inflammable gas it would be an improvement on the chance odors we now get.

There is one thing that I want to put across at this meeting. Some companies charge no minimum bill and our minimum bill is seldom more than 50 cents a month. Grasp if you can the absurdity of anybody expecting to get gas service for a whole year at a cost of \$6.00. This is but a part of a single day's wage of a high price mechanic. How can we pay our own men good wages and still make both ends meet when we attempt to do that which is obviously impossible? No reasonable man or woman would expect us to do it, and yet so long as there are some in our midst who are unwilling to protest against it, it makes it hard for the balance of us to get relief. We are providing a service entirely aside from the exact amount of the gas we furnish. We are entitled to make a charge for providing service in addition to the charge we make for gas. Some of us are now carrying $66\frac{2}{3}$ per cent of all of our customers without profit and more than half of this number are carried at an actual loss. The other $33\frac{1}{3}$ per cent of our customers are either paying the losses on the others or our stockholders are standing the loss.

There is no justification for making $33\frac{1}{3}$ per cent of our customers pay us all the profits we are entitled to, and in addition to this, make good the losses on other customers. Such a situation does not even carry the common garden variety of honesty and justice. You cannot even approach a reasonable degree of equity in your charges without adopting some form of a service charge. It is obvious that with the same return to the company gas can be sold at a lower rate per thousand feet for gas when a service charge is made than when no service charge is made. With a service charge to every customer and thereby a lower rate for gas than it would have to be under the present method of charging, a greater volume of business can be done and the public as a whole served at a lower cost. If I possibly can I want to get every man at this meeting to go back home with the determination to justify his right with his own public to make a service charge to every customer in addition to the

charge for gas and determined to get such a charge. Those whom I cannot convert, I will ask them to go home and make actual figures to show them what such a service charge would do for them and whether they could not then better serve the public and at a lower cost. It is unnecessary to have a service charge as much as \$21.00 per year for the small customers, and yet if a man wants service at all such service should be worth at least \$2.00 per month to him.

There is little justification and little justice in a minimum bill, and many look on it as discrimination against the small customer, while a service charge against all customers does not carry this same argument of discrimination. There can be no equity in charging A 50 cents for one month's service if A has used no gas, and yet charge B 50 cents who has had everything that A has had plus 500 cubic feet of gas. A minimum charge just inherently will not harmonize with equity and justice. What the gas business most needs and at once, is some form of a service charge, and it will be much easier to get such a charge if every gas man will advocate it. I hope the day is gone when those of us who know we need and must have this charge are handicapped by those who will quote Murdoch, their father or grandfather and say, "Well if these men got along without it we can." Or say, "Well the gas business has existed all of these years without a service charge and therefore it can't be right."

Go home and insist on getting a service charge and have the courage of your convictions, for in the end it will be the public who will benefit the most by it.

I lost my appetite many years ago for trying to be a pioneer in the gas business and felt that the day for the pioneer had either passed or had not yet arrived.

If I see any evidence of cooperation from this paper I am willing to reshape my views and do at least my share of the pioneer work toward putting the gas business on a new plane of greater magnitude and prosperity.

Learn to think straight. The analysis of any proposition is very often based upon simple elementary principles which a child can understand after they are discovered.

—HENRY L. DOHERTY.

Perhaps the most important and far-reaching statements made by Mr. Doherty in 1919 were those made during the testimony he gave before the Public Utilities Commission of Kansas July 28-29, 1919, "In the Matter of the Order of Investigation Into Gas Rates at Hutchinson, Newton, and Other Cities Supplied by the Western Distributing Company and Other Cities Receiving Gas From the Wichita Natural Gas Company." The result of this hearing was the immediate establishment of the Doherty three-part rate in several cities in Kansas, and the ultimate result was the passing of an order in 1923 by the Kansas commission establishing that rate method as the one to be used exclusively for the sale of natural gas in the State of Kansas. Mr. Doherty was first duly sworn, and testified as follows:

Mr. R. A. Brown: Your name is Henry L. Doherty?

Mr. Doherty: My name is Henry L. Doherty.

Mr. Brown: What connection have you with the Wichita Natural Gas Company?

Mr. Doherty: It is owned by the Empire Gas & Fuel Company. I am chairman of the Board of the Empire Gas & Fuel Company.

Mr. Brown: As I understand, the Wichita Natural and the Kansas Natural are both owned by the—that is the stock of those companies is owned by the Empire Gas & Fuel Company?

Mr. Doherty: Yes, sir.

Mr. Brown: The Cities Service Company, I believe, is represented by you also?

Mr. Doherty: The Cities Service owns all of the stock in the Empire Gas & Fuel Company and I am president of the Cities Service Company.

Mr. Brown: In other words, the Cities Service Company is the holding company of the Doherty interests?

Mr. Doherty: Yes, sir, and real owner.

Mr. Brown: Mr. Doherty, what experience have you had as a gas engineer or as a practical gas man and over what period of time?

Mr. Doherty: I don't believe you want that in detail.

Mr. Brown: Just approximately.

Mr. Doherty: I have been in the gas business, this coming fall, thirty-seven years. I started as an office boy 12 years old. That is the reason it is so long—I make that explanation. I

have been continually connected with gas companies ever since then and I have been connected with, maybe, as many as sixty or seventy companies. The most prominent position I ever held as a gas engineer, I suppose, was when I was chief engineer of the American Light & Traction Company, which owns properties in different parts of the country.

Mr. Brown: You are a gas engineer, Mr. Doherty?

Mr. Doherty: Yes, sir.

Mr. Brown: Mr. Doherty, in your position with the Doherty people and as being interested in this property, have you at any time taken it upon yourself to make a very careful survey and examination into the natural gas situation as to the gas supplied by the Wichita Natural and other gas companies in which you are interested, for the purpose of determining what would be a scientific method of arriving at rates?

Mr. Doherty: Yes, I have. I have been more or less a student of it at all times. In the natural gas business you are dealing largely with opinions and guesses. The most careful consideration I gave the subject was during the spring and summer of 1917 and the winter of 1918. Outside of the work I was doing for the Government at that time, the consideration of that problem represented the most work that I did.

Mr. Brown: In the prosecution of that work, did you spend a considerable portion of time in Kansas City and this vicinity?

Mr. Doherty: I did. I spent a considerable time.

Mr. Brown: I believe you worked there in connection with the Commerce Club in Kansas City?

Mr. Doherty: Yes, I worked with the Chamber of Commerce.

Mr. Brown: Mr. Doherty, without going too much into detail and taking too much time, I wish you would explain the problems that confront a supply company in the producing and distribution of gas to the distributing companies and what character of rate you worked out in connection with the Chamber of Commerce in Kansas City and what character of rate you would recommend as a scientific rate which would meet the problems that might confront us in the future. Just explain it in your own way.

Mr. Doherty: Nobody ever yet has solved the question of artificial gas for fuel purposes and the future of natural gas companies depends very much on the matter of solving the

problem of artificial gas for fuel; that is, artificial gas to be sold as natural gas is now sold. The reason we have always fallen down on it heretofore has been for economic reasons and for not knowing, I think, the economic problems.

The matter of price fixing for any natural gas company is greatly influenced by the determination of the death date of the property. If it can be supplied with artificial gas, that death date is indefinitely postponed. In my opinion, it is possible to supply artificial gas for fuel purposes and it is not only possible but I am willing to contract to do it, provided I can do it in a way where the customer pays for what he gets and I am not forced to compel some customers to pay for more than they get. There are certain problems worth while thinking about, and when one thoroughly understands them, they can see a good many of the difficulties of the gas business for themselves and figure out a solution.

In the first place, if we were selling gas just for domestic purposes in a climate such as this, we would have to be prepared to give our customers at least eighteen times as much gas on the coldest winter day as we would give them on a normal summer day. We now have no class of gas-making apparatus that is so cheap to install that we can have seventeen parts of it lying idle a large portion of the year, nor is there any type of gas-making apparatus that we now have that will manufacture gas economically which can stand the fluctuations such as prevail if you let the customers use the gas as they wish to use it—as they will use it if you simply charge so much per thousand cubic feet. It would be, in a way, like a hotel letting a customer take a room permanently and not give it to anybody else, but only pay for it when he occupies it. For instance, take the matter of varying the amount of gas you make—if we were using by-product coke ovens, except for one installation in this country which I partially designed and installed, you get the same amount of gas at all times. That is, if an oven produces ten million feet of gas, you must take ten million feet of gas and throw away the part you do not sell, or else sell ten million feet, letting the customers take that as a minimum and go short for the other seventeen parts. So, the problem in the gas business is either to be able to meet these wide fluctuations in the demand for gas or unify the demand.

That comes down to a question of rates. There is no more reason for us to charge so much per thousand cubic feet for gas than to take some other factor and charge on that basis. I can make that plainer if I take the illustration I often use of a telephone company. In the early days most of our telephone companies were put in and they charged a flat rate for telephone service. Let us assume now that we have two customers, A and B. A is a customer who has a telephone in his office just for an emergency call, and to illustrate, perhaps by exaggeration, we will assume that that man does not have but one call a year, and we will assume that the other user has an average, say, of six calls a day and uses his telephone two thousand times a year. If you are charging flat rates, each one pays \$40.00 a year for telephone service and yet one man has the instrument and gets two thousand calls a year and the other one has his instrument and only gets one call per year. Manifestly, that telephone, to the one having two thousand calls, is more valuable to the user and more costly to the telephone company. The public is interested in this, because if the charge is too high for the type of man like A, who only wants to use the telephone occasionally, he won't use it. Therefore the greatest possible volume of business cannot be done and the public cannot get the lowest price possible for telephone service. Let us assume the company comes back later and says, "This method is wrong. We should charge so much per call." They will figure up and say, "To have the same revenue we have now, we will have to charge four cents per call." So they then put us on a per call basis. Then A, who heretofore has been paying \$40.00 a year, pays four cents a year, and B, who has been paying \$40.00 a year, pays \$80.00 a year. Now, again you have your equity all unbalanced, because A is paying manifestly much too little and B is therefore compelled to pay more than he should pay, because the losses on A have to be made up by an undue charge on B. Therefore those customers who have to stand this undue burden of carrying the profitless customers are apt to drop out, and telephone cost to the public as a whole goes up.

In the telephone business we have shown it is impossible to get an equitable charge by using only one factor of the service, and you cannot get an equitable charge for gas service, when you use only one factor of the service. The only way I think you

can get a fairly equitable charge for gas service is to take in three factors and charge on three factors. First, charge every customer a "customer" charge, which will cover fixed expenses. Many fixed charges and operating charges are the same for every customer. It costs about the same to read a meter, whether it has a big reading or small reading. It costs about the same to make out the bill, make the entries, receive the check and bank it, so I have advocated for a great many years the use or system of charges which is known as the "readiness-to-serve" method of charging.

This subject has had a great deal of discussion in the last few years, and a great many men know now that we absolutely must come to this method of charging, if we are going to do equity in these public service companies and are going to get for the public the lowest possible price as a whole. We must absolutely come to it, if we are ever going to substitute gas for solid fuel. "Readiness-to-serve" method consists of a uniform charge for every customer; then a uniform charge per unit of demand. If one customer wants to demand one hundred feet an hour or another wants to demand two hundred feet, then those expenses which are proportional to the capacity of the plant and ability to supply at the rate of demand are put in the demand charge. Then the other charge is for the gas. By the adoption of that method of charging, we can eliminate whatever class of consumers it happens to be who are riding as a load on the other consumers. We then can reach the greatest number of consumers and do the largest volume of business and thereby give the customers as a whole the lowest possible rate.

I have been ready here at all times to take hold of this situation with our organization and try to work out a real solution of this gas problem. We have had a great many things come up that have interfered—the European war first, and then our being dragged into it, and the difficulty of people understanding each other, and the fact that before we had got into this situation a very bad tangle had occurred and a lot of litigation had become started in the Kansas Natural situation—it is always easier to prevent those things than it is to come in and straighten them out. We want to stop nowhere in our effort to work out a satisfactory solution of this problem and give the public satisfactory service.

I believe the public is interested primarily in good service and I don't believe any natural gas company in the world ever gave good service. I never saw one. I have heard lots of gas men talk about good service. They have never given good service and it is absolutely impossible to give good service, except as you are in position to limit those demands of your customers and limit those demands in accordance with their willingness to pay for such demands.

The situation became so crucial in Kansas City, Missouri, that the Chamber of Commerce of Kansas City appointed a special committee; I went out and worked with that committee and stayed with them for a long time. They got up a report which was adopted by their board of directors and was also adopted by a referendum vote of the Chamber. We have asked the Chamber of Commerce of Kansas City if they won't try to have somebody over here to make a statement regarding the work that was done by their committee.

I have a copy of the report in my hands, but I never met the man who wrote this report. You see, the report was written quite a long time after I had finished my work with the committee and they had other representatives of other interests that they wanted to see and talk with, and so this report is very much in their language, although I don't know that there is anything specifically in it that I don't thoroughly agree with. It represents their recommendations to the people of Kansas City, Missouri.

Let us take now another phase of the question for a moment, because this report covers both the matter of natural gas and artificial gas. Let us take for a moment the matter of substituting natural gas with artificial gas. Whenever your supply of natural gas reaches that point where the supply is less than the demand, you are always going to have a very unsatisfactory condition, except as you can either curtail the demand by cutting off certain cities, or curtail the demand by a raise in price or supplement the supply by the use of artificial gas.

The only sensible thing to do, I think, is to supplement the supply with artificial gas, and that is much better than fluctuating the price up and down to the customer, although perhaps both methods might have to be used if things occur suddenly. That is the only way that these cities can be insured a perma-

ment supply of fuel gas—by supplementing the supply of natural gas long before the date of failure of natural gas occurs, and as natural gas drops off in supply, the artificial gas will have to come in and take its place. The problem we face here is one not only of a diminished gas supply, because while your gas will represent a very ragged up and down curve—for instance, Kansas City, Missouri, is right on a geological dome that might produce natural gas and oil, and you never know exactly when or where you are going to punch into gas or oil—the tendency is always for that gas to get farther and farther away and be more and more expensive to bring to these different cities and you not only have the problem of a diminished supply on the whole, but you have also the problem that these cities are growing at the rate of another large city each year. I have forgotten just how much that is—my memory isn't good and I am talking largely from memory of the work I did a little over a year ago—but, as I remember, the growth of these cities amounts to the addition of another city of fifty thousand people each year, and it may be more than that. There you have that increased growth, these people moving right in between the old customers and desiring service; while the tendency of the gas supply is always to diminish and diminish.

In the work we did in Kansas City, they were very strong in the belief that we could not make too early a start in the matter of substituting artificial gas for natural gas, so when this general curve of diminution of gas supply hits its individual low valleys, the artificial gas plants can be there, and be started up. At the time this report was made, the prospects for gas this last winter were very blue. We laid all the facts before the committee and they debated quite a while as to what they were going to recommend in the way of a rate.

They were very positive about certain things: First, that the only way you can properly curtail your demand is by price. In other words, we had the problem of not being able to increase our supply in time for the next winter, and the only other thing left possible to do was to diminish the demand so it would not exceed the supply. They were satisfied from the study they had made that there was only one practicable way to diminish the demand and that was to put up the price. They debated with us what the price should be, so as to restrict the demand

so as to come within the amount we would have to supply. We gave them all the information we had, but it is a very difficult matter to say how much gas you will sell under some certain flat rate. We have had a lot of experience to guide us in selling natural gas, say between twenty-five and forty-five cents, and we have had a great deal of experience to guide us in selling artificial gas, say eighty-five cents and \$1.50, but we have not had much experience with the intermediate prices. They decided to recommend a rate of \$6.00 per customer, plus a rate of eighty cents per thousand until such times as we could build up a supply of gas. We did agree with them that we would pay no dividends and take nothing out representing interest on our investment or anything of that sort until we had built up an adequate supply; that is, that all the money that came into our hands we would immediately use for development work. We had already spent very large sums of money to bring in a gas supply. We had promised certain people out here if certain things were done we would agree to go in and spend two million dollars on the gas supply. The things that we asked should be done were not done, but we had more or less committed ourselves to those expenditures, so we went ahead and, to tell the truth, we spent very much more than two million dollars in producing a gas supply.

Mr. Brown: How much was that?

Mr. Doherty: I think the auditors reported \$5,400,000.

Mr. Fisher: That is practically right.

Mr. Brown: That was checked up and investigated by the Kansas City Chamber of Commerce?

Mr. Doherty: The Kansas City Chamber of Commerce employed a firm of accountants, Marwick, Mitchell, Peat & Co., and they made the report to Kansas City. We had nothing to do with that. We said, "There have been so many contradictions of our statements made, we prefer to have you put auditors on our books and see what we have spent." That was to be the temporary rate—eighty cents, plus a \$6.00 customer charge.

Mr. Brown: That was \$6.00 per year?

Mr. Doherty: Customer charge of \$6.00 per year. All of the readiness-to-serve method of charging must be made on an annual charge.

Mr. Brown: And the 80 cents was per thousand cubic feet?

Mr. Doherty: Per thousand cubic feet. As soon as we had an adequate supply built up, we were to start in on the readiness-to-serve method of selling and these rates were to prevail. I might say that we have had no gas shortage this winter because this is once we played in luck. You know, it is pretty safe to go in on a roulette wheel and double your bet and assume the wheel can't run against you thirteen runs on your ability to double. I have had it run thirteen times against me in business and on this gas situation it easily ran thirteen times, but last year we had some luck and got more gas than we expected, and part of it from right up on what might have been termed old, old territory—territory nobody was watching very much. So we didn't have any shortage of gas last winter although we would have had a very severe shortage on the Wichita and Quapaw lines if it hadn't been for that accidental discovery, because we had planned to proportion our gas. You see the cities on the Kansas City line are now paying 80 cents and the idea was to give them their complete supply and then take what was left over for the others, because by even giving them the complete supply they would not get the pro rata these other cities would get. We never put in that restrictive rate except as it was put in independently by Judge Booth, and we would now be in a position to start on our readiness-to-serve method of charging, provided we were sure we would have no deficit during this coming year. It would simply be a question of being able to start early enough and get our plans going early enough for additional capacity of gas and lines and everything of that sort.

The plan was that after this temporary rate of \$6.00 plus 80 cents had been in vogue long enough for a supply to become built up, the rates would become as follows for natural gas: a consumer's charge of \$6.00 per year; a demand charge of 32 cents a year for each foot demanded in an hour (that means if a man wants to demand ten feet of gas an hour, only for some small purpose he would pay \$3.20 a year for the right to be able to have, any time he wanted it, ten cubic feet, if he wanted a right to have 100 cubic feet, he would pay for that right \$32.00 a year), and a charge for natural gas of 30 cents per thousand.

Mr. Stone: That charge is wholly independent of the amount of gas which he actually took?

Mr. Doherty: The customer's charge is wholly independent of the amount he pays under the demand charge or the amount of gas he takes. The demand charge is wholly independent of the amount of gas he takes. Each one is plus—a consumer's charge plus a demand charge plus a gas charge.

Chairman Kinkel: These charges are payable monthly?

Mr. Doherty: They are all payable monthly and they pay one-twelfth of their annual readiness-to-serve charge each month. By the way, it tends to greatly lessen the big bills of winter and it adds correspondingly on the small bills of the summer, and where this method of charging has been used it has enormously reduced complaints. In the early days before we had reliable electric meters we used to sell current on flat rates and some of those flat rates were awful things. We always greatly overestimated power loads of certain characters like elevators. I remember one time, when we got a meter on, a man's bill was something like \$2.20 a month, and yet that fellow that had that elevator used to pay \$40 a month on a flat rate for power. You can charge a man and horribly overcharge him on a flat rate and he will never complain. If he makes an agreement to pay \$10.00 a month or \$20.00 a month, he never complains although he may be paying twice or three times what he should, but you put him on a meter basis and let his bills vary from month to month and even if he is paying less than he should pay he will complain. So anything that goes to equalize bills, making the larger ones smaller and the smaller ones larger, tends to reduce the complaint.

The artificial gas price was to be a customer charge of \$6; a maximum demand charge of 50 cents a year per foot and a charge for the gas of 40 cents per thousand cubic feet, but a thousand cubic feet should consist of whatever number of cubic feet was necessary to give the equivalent of a thousand cubic feet of natural gas. That schedule of charges, by the way, would give the cheapest gas service of any place in the United States, but it is predicated on not observing what might be termed the unnecessary features of present standards. For instance, the day is long since past when we are interested in a candlepower standard. Luminosity of an open flame is useless in the gas business today and the public would be greatly benefited if they were compelled to use incandescent lamps instead of open

flame, yet in many of our states we are yet required to supply a certain candlepower, that having been enacted in days when we depended entirely on illumination from an open flame. So the gas we would supply under this would be a gas having rational standards of quality—it would have a certain standard of smell, a certain standard of odor, so people would be protected in its use. It should have a flame temperature at least that of natural gas, and standards of that sort, thoroughly rational standards, the idea being to permit gas to be made out of any material that is available. We do the most ridiculous things in the world now. We have got to fixing on a 600 B. t. u. gas. Well, 600 B. t. u. doesn't mean anything. It just happens that the gas you distill from coal is a mixture of carbon monoxide, hydrogen, marsh gas and a small amount of heavier hydro-carbons, giving on an average the value of about 600, but no elemental gas has a value of 600 B. t. u. per cubic foot and only by making a mixture of different gases can you get 600 B. t. u. per foot. When we make gas out of certain materials, they don't make gas of that particular value, and yet they have just as much value per B. t. u. Take a blue water gas—it has a very much higher flame temperature than a natural gas has, yet blue water gas has less than 300 B. t. u. per cubic foot, while natural gas has 1000. You can't use natural gas for certain work because it has such a low flame propagation that it won't work, yet there is no place you can't use blue water gas. For instance, if you try to use natural gas in a blow pipe it blows itself out, but blue water gas works beautifully in a blow pipe. There is only one place where natural gas works better than blue water gas and that is in a gas engine, but there are many places where natural gas is not nearly as valuable as blue water gas though it has only a value of 300 B. t. u. per cubic foot.

The amount of B. t. u. per cubic foot in gas has nothing to do with its properties. Some of these gases absorb heat in their decomposition before they start to burn. Natural gas is one. Other gases will, in addition to all the burning of the elements, give off heat just due to the breaking apart of the molecules. For instance, marsh gas is CH_4 . It has about 12 pounds of carbon and 4 pounds of hydrogen; yet it would not give more than 90 per cent of the heat that would be secured by the burning of 12 pounds of carbon and 4 pounds of hydrogen because about

10 per cent of the heating value is used in breaking the molecules apart. With acetylene gas, this is just the opposite— C_2H_2 . That gives about 20 per cent, I think, greater value than would the hydrogen and carbon if burned separately.

I was very sorry when the decision of the court virtually separated the local company from the transportation company. Anybody can throw a wrench in the gear box and prevent solving this gas problem. It doesn't take much brains to do that and it doesn't take very hard work, but to work this thing out—and it can be worked out and worked out with the greatest ease—to work this thing out and assure to the people of these communities a complete gas supply for all time to come at rates away below the real value, simply requires everybody to have a willingness to work together and to be able to trust each other to a reasonable degree. In the first place, the public in one way are not interested in the rate they pay. They are interested in the cost to do work. I remember one day when one of these smelting concerns came into my office and insisted they could not afford to pay any more for gas and I said, "You are not interested in the rate that you pay for gas; you are interested only in what it costs you to smelt per ton of metal." They finally admitted that was true. I said, "You can save in your process an enormous amount because you are brutally using that gas. You have no regenerators on your furnaces. It is brutal. I can show you how to save half the gas you are burning."

It was unfortunate, in a way, for the people of this community that gas was ever put to them at the price of 25 cents. People ordinarily pay about \$1.00 a thousand for artificial gas. When you come along and sell natural gas for 25 cents a thousand cubic feet, it is like offering to sell them dollar gas at 25 cents. The tendency is to waste it. The most awful waste imaginable has characterized the whole of the gas field and still characterizes everything in connection with the natural gas business. I was raised in the artificial gas business and we regarded it as gross mismanagement if your leakage went above 150,000 cubic feet per mile of main—that generally meant a very small percentage of leakage.

When I went into the electric business and realized there wasn't an alternating current plant in America that was selling more than 35 per cent of the current it generated and 65 per cent

was lost in the meters and transformers, that was a shock to me. I took the city of Madison, Wisconsin, when I was manager, then from a line, meter and transformer efficiency of a little below 30 per cent to a little above 80 per cent. I had the remarkable situation that on one circuit the shunt loss of my meters was more than the core loss of my transformers and through that we got a better meter that didn't have as large a shunt box.

What this situation needs out here most of all is first to get on some basis where we don't feel we must start in and amortize our property at the greatest possible rate. We have about reached the conclusion that we must either see a solution of this problem or start in to amortize it at once—avoid any expenditures that cannot be quickly determined and either salvage the property for as much as we can get out of it, or else work out some solution whereby we can give the property an indefinite death date by substituting artificial gas when natural gas is no longer possible. In doing that we need the cooperation of everyone. I don't know how we are going to make all the discriminations everyone wants us to make. This man doesn't want to pay the same price as everybody else for this or that reason. We perhaps cannot work out an exact degree of equity between all of these different cities on this entire system—that is the combined system of the Kansas Natural Gas and the Empire system—but we can work out benefits to every city that would be much greater than if they were standing alone and if they don't get all the benefit they are entitled to, they ought to remember that by cooperation with the other cities they are able to get great benefits. There must be a certain amount of tolerance.

I want to be sure our people go as far in that as possible. I have worked on this thing and it has at times got on my nerves and I am sorry for every time I have spoken shortly, because I want to keep as far away from anything that produces controversy as possible. We want to try all we can to see if we cannot work out some sort of permanent system. If we feel it can't be done, there is nothing left to do but try to salvage our property and get back as nearly as we can the value of the property.

The most important thing that I wanted to say is, I want to work in partnership with the distributing companies if that can ever be made possible. The distributing systems now are

wasting enormous amounts of gas by leakage, horribly unnecessary amounts. They always have been. If we can work with them, I want to see this leakage thrown over on them, although it belongs just as much on them to work out as it does us. It is revolutionary to throw that all over onto them in a day and I want to work out some solution whereby the distributing companies do not feel it is a hardship to have it thrown over on them.

The matter of this extravagance does not stop there. We all started in with the belief that natural gas was abundant. In the early days we had a few wells out here, and I was consulted about the feasibility of taking this gas to Chicago on the theory that these communities never could take it all.

The customers are the most extravagant of all, frightfully, frightfully extravagant. With them, of course, they don't know any better. They have never been shown. The big part of the time the distributing companies have been broke. I don't know whose duty it was to show them. If we could get started and work the thing out in proper lines, my idea was to put in service departments in all of these different cities and try to show the customer not only how to get reasonable economy out of the gas he buys but get satisfactory service out of it, and I still maintain that the customer is always first interested in good service, yet everybody seems to think that the customer is only interested in low rates.

Mr. Brown: How much would you be willing to pay annually just to teach the people how to use gas?

Mr. Doherty: I don't know now exactly what we decided on. We have started in a small way. I know we fixed on a willingness to spend \$500,000 a year on that work and keep it up until everything is taken care of. That is the way the thing is going to be worked out, by sitting down and showing these distributing companies how to cure this leakage and bringing in the necessary experts to show the customers how to use their gas to get good service and economy out of it.

Mr. Brown: I would like you to give the Commission and those present, if you can, an example as to what gas would cost under the three-part rate as described by you, for two or three customers, and show approximately what gas would cost the user of gas as compared with the price at the present time.

Mr. Doherty: In the electrical business we use a term, "load factor"—I suppose you men have heard it used a great deal before the Commission, but as I am personally trying to interest some of the men in the audience here, and perhaps attorneys, who do not know what "load factor" means, I am going to indulge on your time by saying that, generally speaking, the load factor means the percentage of current sold in relation to the maximum demand. If you take the maximum demand and multiply it by the number of hours in the year and then divide it into the amount of current bought by the customer, that would give us his load factor. If he used it half of the number of hours in the year, he would have a 50 per cent load factor. If he used it a quarter of the number of hours in the year he would be a 25 per cent load factor customer. Of the charges that I have stated here, the \$6.00 customer charge would be a uniform charge, and, by the way, that is not quite as high as it ought to be because it doesn't even cover the definite charges traceable to the consumer's work, but the rates I have read to you really represent more the Chamber of Commerce rates—we refer to it as the Chamber of Commerce rates as we were really trying to bend our ideas to theirs so they could say, "That represents our views." As your consumer's charge is a fixed amount of \$6.00 per year, what that amounts to per thousand cubic feet is purely a matter of quantity. If a customer only burned 6000 feet of gas a year, it would amount to \$1.00 a thousand, but if he burned 60,000 it would amount to 10 cents a thousand, and if he burned more than that it would reduce it accordingly.

Mr. Brown: In any event, it is 50 cents a month?

Mr. Doherty: Yes. The demand charge amounts to $8\frac{3}{4}$ cents, or, rather, a demand charge of $8\frac{3}{4}$ cents per thousand would amount to exactly 1 cent per thousand feet on the 100 per cent load factor; that is, it would amount on the man who used his gas every hour in the year, to 1 cent. The charge we have specified is 32 cents.

Mr. Brown: In addition to the customer's charge and demand charge, you propose to sell the gas at 30 cents a thousand cubic feet?

Mr. Doherty: That is the burner price, you understand.

Mr. Brown: At the burner tip?

Mr. Doherty: Yes.

Mr. Brown: How was that distributed with the distributing company?

Mr. Doherty: We proposed at that time—that was before the decision came down from the Supreme Court—we proposed to divide it, the local distributing company to get all of the customer charge; the demand charge to be divided, 20 per cent to the local company and 80 per cent to the producing and transporting company; and of the gas charge, 20 per cent was to go to the local company and 80 per cent was to go to the producing and transporting company.

Mr. Brown: Have you made any illustrations to show whether the average gas consumer would pay more or less under this method than under the present method charged in Kansas City?

Mr. Doherty: Even on the present basis, he would pay much less than he does under the present rate in vogue in Kansas City, but, for instance, if you were to take Kansas City and apply this rate today, when a man, having once paid his fixed charge, could buy all the additional gas he wanted at 30 cents if he didn't increase his demand, he would use a great deal more gas, so I have an idea, if this were in effect, it would bring the price of gas for Kansas City people, as a whole to less than half what they would ever get on a straight rate.

Mr. Brown: Would this permit gas for use in certain industrial purposes? If a man paid his demand charge and readiness-to-serve, he could buy all he wanted?

Mr. Doherty: Provided he doesn't increase his demand.

Mr. Brown: You speak of supplementing this natural gas supply with a supply of artificial gas. Was it your purpose to mix the gases in case the supply of natural gas was not sufficient to supplement that, mix the artificial gas with it?

Mr. Doherty: We can only mix certain artificial gases with natural gas, and we thought it would be better—failing to solve that problem—to cut off certain towns and supply them with artificial gas and go on and treat them as still on the system; then we could handle that group. I don't know exactly how we are going to do that. It is one of the necessary things to determine. We are going to do it. We are willing to take the responsibility of working that out regardless of the fact that

the charge we have here would only correspond to 24 cents for 600 B. t. u. gas. In other words, we are sure, if we are allowed to do business on the readiness-to-serve method, we can set up conditions that will be so much lower to the customer that he will respond and become a good user of gas and not cause us the expense he does now. Everybody now goes in and tries to heat up their houses in the morning. If they were limited in their demand, they would try to keep up their heat at night; they would heat up the water when they were not cooking; they would give us a uniform load. If we were to adopt this method of charging, those who maintain more than one servant in the house would tend to pay for demand very much less than enough to cook and entirely heat their houses; they would pay for a demand that would give them a reasonable amount of gas for spring and fall heating, and then when they were compelled to start up their large furnace, they probably would make a lesser demand on us for gas in the winter than they would at any other time, because if people have got help around the house they can better afford to avoid the demand charge than those who haven't got the help. The demand is high in some of the bigger homes, yet they have help around the house that could take care of a furnace. That is one way we hope to get to a fairly good even demand throughout the year. What we want to do is to have a demand, if possible, so it is in the summer time within 50 per cent of what it is in the winter. We believe we can develop an enormous sale of gas for industrial purposes; in fact, we are supplying huge quantities of gas to the Willys-Overland Company at prices above those named here as the final price to the customer.

Mr. Brown: For industrial purposes?

Mr. Doherty: Yes, sir. We are making a special character of gas for them of a very high efficiency.

Mr. Brown: That is an artificial gas you are manufacturing especially for them?

Mr. Doherty: Yes, sir.

Mr. Brown: That is the Willys-Overland Automobile Company at Toledo, Ohio.

Mr. Doherty: Yes, sir.

Mr. Brown: Mr. Doherty, in the event you could not agree upon this three-part rate or whatever you may term it—I be-

lieve this was originally your rate you worked out many years ago for electricity?

Mr. Doherty: It was worked out for any form of service where the customer fixed the demand.

Mr. Brown: Is this character of rate in general use in supplying electricity?

Mr. Doherty: Yes, and it is universally used now as a method of determining the rate to quote. The rate itself is set forth in a paper I read before the National Electric Light Association in May, 1900.

Mr. Brown: Now, Mr. Doherty, in case you could not agree upon this rate, have you considered a flat rate and what the Wichita Company would be required to charge at the city gates in order to permit you to continue business?

Mr. Doherty: Yes, I have. As far as your gas charge goes, you must either keep your charge pretty well down to the cost of solid fuel or else must expect an enormous diminution on the amount of gas the customers will take. Let me illustrate in this way so you may thoroughly understand what our position is—that it is not a wish on our part, but an absolute necessity: Here is a city being supplied, we will say, with artificial gas at \$1.00 per thousand, and we know that the customers in that city are very much satisfied to use that gas at \$1.00 a thousand for cooking and water heating and incidental lighting. They will pay us about \$30.00 a year. Along comes a natural gas company—and this happened right in Kansas City—along comes a natural gas company and they say, “We will give gas for 25 cents, and it only takes 18,000 feet of natural gas to do the same amount of work that was done by 30,000”; so they undertake to give that customer, who was perfectly satisfied to pay his \$30.00 for cooking and lighting—they attempt to give him enough gas to do that for \$4.50. Now, that service is worth to him a great deal more than that, but you must keep your price of gas pretty well down before it is cheaper to use in his grates and furnaces, so, as you commence to raise the price of gas, you get to the point where you drive off eventually everything on your lines except the lighting and cooking.

I can't get an indication from the different distributing companies, and especially those on the Kansas Natural lines, of what they are willing to take, based on some price at the city gates,

and it looks very much as though we would have to continue to work at arm's length. If the price gets too high, it limits the amount we can carry in our transportation system until our cost becomes very huge, and I can see how, under certain conditions, our cost will become \$1.00 a thousand. After you have crossed a certain line—after you have crossed the line where your cost is equal to the artificial gas cost—you may simply forget every cost above that, so we have decided, and I will show anybody who is willing to give me the time why it is a necessity on our part, where there is nothing left for us to do except to ask for the maximum rate we can receive, which is 45 cents at the city gates. The only reason we won't ask for more under certain circumstances is that it simply means you could substitute artificial gas at less. We either must try to work this thing out on a fuel gas basis, or else we must go to costs, which I think eventually will go to the cost of artificial gas. In other words, I think you will find the distributing and producing companies will have to have a price which will correspond to the price of artificial gas. It is not a question of profiteering, but the actual basis.

Mr. Brown: Could you elaborate a little on the proposition of why it is necessary to have the 45-cent rate?

Mr. Doherty: I didn't intend to go into any of the figures, but I will go into it in a general way. In the first place, if this fight is going on, we will never get any place unless we can get some sort of a basis on which to do business, we will never get any place at all, and there is nothing for us to do except to try to amortize our property while we have still gas to do it with, but aside from the amortization of the property, our costs have been increasing enormously for the matter of finding and getting new gas, and those costs add nothing to the earning power of the property. They add nothing to the value of the property. Much of the work we did heretofore was simply taking up lines from one field and laying them to another one. Those costs are very large, although we have a rate now of 80 cents on the Kansas Natural lines. Our men estimated they were selling 58,000 cubic feet of gas for a year back, and they estimate their sales will be less than 50,000 feet per meter this year. As your quantity of gas goes down, it is a lesser divisor into your expenses, and it is astonishing the way costs go up.

Mr. Brown: Even at the rate the Kansas Natural has been charging during the past year, it is largely in the red?

Mr. Doherty: It is still going in the red, not making operating expenses even.

Mr. Brown: And the rate Judge Booth has fixed for the Kansas Natural, 32 to 35 cents, is not compensatory, but merely an estimated rate by which the property could be administered without making any profit?

Mr. Doherty: It is not a compensatory rate, but is merely a rate sufficient to administer the property.

Mr. Brown: I think that is all, unless the Commission want to ask him questions. I would like the Commission to understand that we bring Mr. Doherty here just for you to elicit any information you desire from him.

Chairman Kinkel: I wonder if Mr. Doherty could figure out some practical application of this theory of his. Under your theory, Mr. Doherty, take a home that has the ordinary burner under a hot water tank, and a gas stove with the usual four openings and the oven, what would the rate amount to?

Mr. Doherty: How big a home is this going to be?

Chairman Kinkel: No heat in the furnace; just for cooking and heating the water.

Mr. Doherty: And not heating the house?

Chairman Kinkel: No, sir.

Mr. Doherty: Your rate there would be rather high.

Mr. Brown: Mr. Hamilton has the exact figures.

Mr. Doherty: I would like to give that and I think I will disagree with Mr. Hamilton. A man would have to pay there, as you see, Mr. Kinkel, for his demand and would not be using it much of the time.

Chairman Kinkel: No lighting at all; just simply for cooking and heating the water.

Mr. Doherty: I am inclined to think if he could keep off his hot water heater—

Chairman Kinkel: Suppose he had one of these regulators with pilot lights on?

Mr. Doherty: His average rate for that work would be all the way from 80 cents a thousand down to 60 cents a thousand, depending upon the efficiency of his appliance, and, strange as it may seem, the cost goes up as the efficiency of the appliance

increases. As you lessen the amount of gas, the price goes up. Let us take that same fellow with a nine-room house and see what his expense would be.

Mr. Jackson: What service charge did you figure on him there?

Mr. Doherty: I approximated and got it by a different way, but I can do it the full way and give you the answer. It figures out \$31.00 in a consumption of 30,000 feet of gas.

Chairman Kinkel: He pays 50 cents a month for service charge?

Mr. Doherty: He would pay whatever his demand was. I figured that on a 50-foot demand, but if you will let me take that on a man using it for heating and cooking—we like to get it on the basis of a full user.

Chairman Kinkel: Suppose a man had a furnace in his home in which he could use natural gas and he wanted to use the gas up till the first of November or December and substitute coal up to the first of March. Would your rules be so flexible that the demand charge or the readiness-to-serve charge would be modified each month in the year?

Mr. Doherty: Oh, no, sir. He would have to pay for his maximum demand.

Chairman Kinkel: For the twelve months' period?

Mr. Doherty: No matter when it occurred. You see, there are certain businesses where the foundation of the business is the non-coincidence of demand. The fact that every customer does not want his money at the same time is the fundamental basis for the banking business to exist. Let us take the matter of any business done as a central station business—let us take the electrical business as an illustration: I have four corners down here in Topeka, for instance—on one corner I have a church and on another a factory and on another corner I have something else, and on the other corner I have something else. None of these places happen to be going at the same time the other is going. If each one were supplying themselves with service, they would each have to have a 100-kilowatt plant, but immediately you start to supply them from a central station and supply them in common, because there is no one using it at the same time as the others, 100-kilowatt capacity supplies them as a whole. That is the legitimate profit of the central station.

The other side of that is they must have the transportation system to get that diversity of people, making thereby a lesser reserve possible. But let me work that example out for you, to show how that will work out on a complete customer. We are trying to get at and have the complete customer, not the man who uses the gas company as a convenience. If you would take a nine-room house on that basis, they would pay practically \$84.00 a year. They would take a demand of $12\frac{1}{2}$ cubic feet per room and the demand they pay for house heating would not be increased by cooking and water heating because they could, while they were cooking and water heating, turn the gas off on their heaters. They would pay \$84.00 a year for 144,000 cubic feet of gas. On that basis they would pay an average of 60 cents per thousand cubic feet, yet they would be a very poor customer compared with an industrial customer. A small industrial customer using the gas all the year around would get a still lower average cost.

Mr. Matson: What information would you have to have to determine the rate for an individual customer?

Mr. Doherty: In advance.

Mr. Matson: That would not be an easy matter to do.

Mr. Doherty: The way the rate would be proportioned would be this: We have developed a demand limiting device, limiting the demand to any amount wanted. Our people would give him advice as to what he probably would want. I have figured on a demand of about $12\frac{1}{2}$ feet per hour per room to take care of almost everybody, so his demand charge would be about \$3.20 a room after you got above five rooms.

Mr. Matson: \$3.20 per room per year.

Mr. Doherty: From \$3.20 to \$3.50 per room per year.

Mr. McCune: In installing this, you would pretty nearly have to tell the customer what his demand would be, to start with?

Mr. Doherty: Our idea was to install it and let the consumer fix his own demand, and any time we had the gas and ability to do it, the customer could come in and increase his demand, but when he would contract, he would contract for a year's period.

Chairman Kinkel: Suppose the patron had the plant I described and he figured that he would need 5000 cubic feet of

gas a month under your plan, what would your charge be?

Mr. Doherty: He would need 5000 feet per month—if you will use that each hour in the month, you would only take it at the rate of 7 feet an hour, so you would pay in that case a little less than 42 cents a thousand, if you used it steadily throughout the month, day and night. If you use it on a 50 per cent load factor basis—that is, use it 12 hours a day—I won't guarantee the accuracy of all these figures—it would cost 50 cents.

I would like to make a little statement before I am cross-examined. I am not sure of any of those figures I worked out here this morning. I don't seem to be a very good arithmetician these days. Mr. Hamilton, who has been employed on this case for valuations and work of that sort, has a table here in his record that shows the average cost of gas for different demand and different load factors. I will briefly state what they are: A 25 per cent load factor, which would be using the demand a quarter of the time, the average rate of gas would be 50 cents on a 50 foot demand. It would go down to 48 cents when you got up to 100 feet demand; 47 cents when you got up to 150 feet demand, and 46 cents when you got up to a 200 foot demand. Now, for a 100 per cent load factor, anybody that used their gas all the time could balance out the load when they were not doing something else, could be heating water. The rates go from 40 cents on the small 50 foot demand down to 38 cents on the 200 foot demand. Now, I wanted to make, in addition to that statement, the statement that on all of these demands we would be figuring on now, it would be high and would indicate a much higher bill than would eventually prevail among gas consumers, because there has never been an attempt made to keep down demands. The gas man hasn't appreciated the importance of it, or if he did, he didn't try to do it. For instance, with a small cooking range using electricity, they fix the range so it can't demand more than two kw at a time, and two kwh of electricity would be, roughly, 6.8 feet of gas. Now, the large size range, one of the electrical engineers tells me, is limited to five kw, and that would be 17,050 B. t. u., or would be about 17 feet for a large range, equivalent of 17 feet of gas for a large range. Any of these demands we now figure would necessarily make the consumer's bills larger on the start, and they would gradually go down.

Mr. Jackson: Of course, I won't expect to cross-examine you to any extent on this study you have given us. I think it is very interesting and no doubt very profitable, but it is new to us. I take it from this study that you have worked out a scheme, as you think, so that the rates will decrease in adverse ratio to the use of gas or the constant use of gas by the customer?

Mr. Doherty: I don't know the term you use exactly. I can't say that the more gas that was used, the less the cost would be—you mean for the individual customer?

Mr. Jackson: Yes.

Mr. Doherty: Yes, the better the load factor, the lower the rate would be.

Mr. Jackson: I wondered if it would be generally correct to say that the result of your study is that for the customer—under this Kansas City study and the prices assumed there, if he uses the gas for nothing but cooking, he would have about an 80-cent rate?

Mr. Doherty: I was wrong about that. The rate, if they use it for nothing but cooking, would be much higher than that. I will either use Mr. Hamilton's figures or else let him tell you what it is figured at. It is all tabulated and he can give it to you exactly.

Mr. Jackson: Would it be approximately correct, for the purposes of comparison with the other classes, to say about 80 cents or between 80 cents and a dollar?

Mr. Doherty: I would say between 80 cents and a dollar.

Mr. Jackson: Then for the next class, who use it for heating of houses as well as cooking, you would think about 60 as compared with the 80?

Mr. Doherty: I would say many of those customers would have as good as a 25 per cent load factor. If they did, they would have the rates I read to you there, which are as low as 46 cents.

Mr. Jackson: Then there would be a still lower class. using it for boiler or industrial purposes?

Mr. Doherty: No matter what the purpose they used it for, if they used it 100 per cent load factor, the lowest figure is 36 cents.

Mr. Jackson: Of course, use would not make any difference, but I was trying to group them into the different classes that would have the different demands.

Mr. Doherty: It is purely the relation, General, of the total consumption in relation to the demand.

Mr. Jackson: For myself, I have been wondering since I heard your testimony whether there would be a great many of these different demand prices or just two or three. Would there be as many as there are customers, or would you attempt to classify the customers into these two or three classes you have spoken of?

Mr. Doherty: Our idea was that, generally speaking, all customers would go exactly under the same rate; that is, they would all have a uniform customer charge and all have a uniform demand charge and they would all have a uniform gas charge. That would work out different average costs for gas on a per thousand cubic feet basis, depending on the relation of their consumption to their demand. Then we would have to establish later—and we didn't intend to take that up with the Commission at this time—what would correspond to rates for "dump power" at the waterpower plant, gas we could not contract for at the beginning of the year over one year, yet we would have available for sale. Your Mr. Strickler is familiar with the term of "dump power." That is why I used that term.

Mr. Jackson: Each customer would not have an individual demand charge?

Mr. Doherty: They would all have an individual demand charge. They would all have exactly the same charge, but they would fix the amount of demand that would be.

Mr. Jackson: That would be a matter of contract?

Mr. Doherty: That would be a matter of determination of each individual customer.

Mr. Jackson: It is suggested that perhaps you could tell us in a few words how you arrived at that demand charge.

Mr. Doherty: I can't go into the details of that now intelligently, because I did the work more than a year ago and I haven't got any of my records here.

Mr. Jackson: Can Mr. Hamilton explain that to us?

Mr. Doherty: Mr. Hamilton has been employed to take up this matter, and I know, not having my figures before him, he arrived at identically the same charge, but he did it by his process of figuring and I did it by mine.

Mr. Jackson: Did I understand this morning that there is no

city in the United States, or community, that is upon this basis for the use of gas at present?

Mr. Doherty: Not wholly. This rate has been used generally as an optional rate and not as a complete rate.

Mr. Jackson: Has it been used as an optional rate for the sale of natural gas in any community?

Mr. Doherty: We use it in all of our artificial gas plants, and I suppose we must use it in our natural gas. In a great many properties it is used as an optional rate. It is used in the electrical business as an optional rate, and has been for many years.

Mr. Jackson: What has been your experience on it in those cases where it has been used either as an optional plan or compulsory?

Mr. Doherty: Our experience has been very satisfactory. The central station experience has been very satisfactory and the customer's experience has been very satisfactory, but the trouble is this, that there is no such thing as having optional rates which won't work to the disadvantage of the company, and so far we have always had this as an option rate and not as a universal rate applied to everybody.

Mr. Jackson: I assumed that it being an option rate, you would not have much complaint from your customers, because if they didn't like it they would take the other rate.

Mr. Doherty: That is right.

Mr. Jackson: So you didn't have any opportunity on gas, at least to see how it affects the public?

Mr. Doherty: In some form or other. In modified forms, certain features of this rate have been adopted universally in some cities. In many cities it is the universal custom to have a customer charge. I don't know of any case where a demand is forced on everybody. In some cities now a customer charge is forced upon everybody.

Mr. Jackson: Is it forced upon anyone—adopting your language—in any place for the sale of electricity?

Mr. Doherty: Yes, for the sale of electricity and for the sale of gas and for the sale of natural gas, but only the customer's charge is enforced on all customers—not the demand charge.

Mr. Jackson: You don't enforce that, then, in the electrical fields either?

Mr. Doherty: For certain classes of service we do, and I think there is one electric light plant in Memphis, Tennessee, that sells only on the readiness-to-serve basis. I think that is universal as to that company, but not universal to the city.

Mr. Jackson: The point I was endeavoring to get was whether or not it resulted in any complaints on the part of the customer as to the charges.

Mr. Doherty: Generally speaking, I would say this perhaps as being a general answer and very true answer: We find in the public utility business that anything that brings about a raise to any customer is not satisfactory to him, no matter how little he has been paying before or anything of that sort—anything that works out a raise; but I have seen the matter of a customer's charge applied to all customers in different cities and I can't say it caused any great amount of dissatisfaction. I think when properly explained they all thought it was fair and should be done.

Mr. Jackson: Then there is no particular point against it, or, you might say, in favor of it, on account of lessened complaint on the part of the customers?

Mr. Doherty: Once it was done, you would have much less complaint and less friction between the public service corporation and its customers, just on account of the fact that it tends to make the bills more uniform throughout the year. That is what causes complaints.

Mr. Jackson: This study that you have brought before the commission was made at Kansas City?

Mr. Doherty: Not entirely in Kansas City, but the work in connection with the Chamber of Commerce was done entirely in Kansas City.

Mr. Jackson: Do you know what the distributing company there thinks of it or how they view this system?

Mr. Doherty: No, I don't.

Mr. Jackson: Did the distributing company take any part in the study?

Mr. Doherty: The distributing systems were not in the study when I was there, although I think the committee conferred with them. I am quite sure the committee conferred with representatives of the distributing systems before they made their report. I never heard whether they endorsed it or disapproved of it.

Mr. Jackson: You have not had any conferences yourself, Mr. Doherty, with them, so you would be able to state whether they would approve it or disapprove it?

Mr. Doherty: I don't remember ever discussing it. I can't say whether they approved or disapproved. I don't know whether they ever expressed it or not.

Mr. Jackson: Of course, it would be assumed if this plan were adopted that you had an adequate supply of either natural or artificial gas or both, wouldn't it?

Mr. Doherty: Not necessarily. That would be the condition we would want to have. Not necessarily, because I can't imagine a more ideal condition than not only being able to proportion the gas between the different cities, but to have your mechanical mechanism such so that you could actually proportion the gas between customers if you did have a shortage.

Mr. Jackson: But necessarily you would take the sum of the demands to be what you would have to supply for that year, and of course if you didn't do that the system would not make good?

Mr. Doherty: Yes, roughly, except so far as the non-coincidence of peak load would go. In a bank everybody doesn't want his money at the same time. In the gas business, it is different because everybody wants gas on a cold day.

Mr. Jackson: When you made this study, there was an evident lack of supply, was there not, so far as natural gas was concerned?

Mr. Doherty: Yes, sir; there was.

Mr. Jackson: And it was assumed that you were going to supply that deficiency, in part at least, from artificial gas?

Mr. Doherty: We were not going to try to apply the demand system of selling until we had built up an adequate supply. We were going to put in that rate of \$6 plus 80 cents and applying just the customer charge and the gas charge until we had built up an adequate supply. We have got enough of a supply now to start the system on, but not to run very long, but if this rate were approved and adopted we would immediately start an elaborate drilling and transportation campaign to provide the gas. After a city, like Kansas City, has been without gas and had totally unreliable service, it takes a long time to reestablish the confidence of the public. I don't think the demand would be much larger this coming winter in Kansas City, even though

this plan went into effect, and we would have more than a full year from the present time to bring in additional supplies of gas.

Mr. Jackson: There is one other question I wanted to ask about your plan. You would expect the customer, when he was listed at a certain demand charge or a certain demand, not to take any more than that at any time?

Mr. Doherty: We would fix him so he couldn't.

Mr. Jackson: How would you do that?

Mr. Doherty: We have a limiting device which is accurate and will absolutely prevent more gas from passing than it is set to pass.

Mr. Jackson: So if I went on a 50 foot demand something would happen to me if I undertook to use 100 feet?

Mr. Doherty: Nothing would happen, except you could turn all those valves you wanted to and no more than 50 feet would come out.

Mr. Jackson: It would be fool-proof?

Mr. Doherty: Unless it was tampered with. We don't have much trouble with that, though.

Mr. Jackson: Can you give us a brief description of that device in the record? Some of these gentlemen haven't heard of it.

Mr. Doherty: I couldn't do it without a diagram, but if you will take any one of the old type of governor burners that will give you a very clear idea of it. For instance, we have a governor in all of our jet photometers. There will be a variation in the amount of gas if the gas changes in gravity, but for gas of common gravity it would be quite accurate. Anybody that wants to know about it, if you will tell them to look up the different kinds of governor burners, constant governors, that will give it to you.

Mr. Jackson: It hasn't any other name by which you can designate it?

Mr. Doherty: We call it a demand limiting device. The different methods we might use were drawn up in the New York office and then sent out to our Bartlesville office. It has been tested in our different laboratories, one testing against the others.

Mr. Jackson: The most we would be interested in in this hearing would be to have some one, yourself or some of the other gentlemen, say that it is practical.

Mr. Doherty: I would say it is because it is done every day on a governor burner.

Mr. Jackson: What you said a few moments ago concerning this study at Kansas City and its purposes, etc., and the probable supply at that time for the next years, it seems to me, makes it pertinent for you to state to the commission what you would advise in regard to this rate, whether you would advise the commission to adopt, fixing a rate now for the distributing company this scheme or some other scheme, or this scheme in a modified rate, or flat rate.

Mr. Doherty: I would advise, without qualification, the use of the readiness-to-serve method of selling. I will go farther than that and say only by that method of selling in its universal application can you solve your gas problem and give people gas at a low rate. That is the only known method by which we can make fuel gas possible when it is to be supplied eventually as artificial gas. We have, in the study that we made, fixed on certain rates here. We believe those rates are necessary and fair. We know that it will give to the customer service at far less than its value; that is, as against anything else he might have, this rate will give him service at much less than the value of the service. So our recommendation would be, without hesitancy, the adoption of this method and the adoption of those particular rates.

Mr. Jackson: And you think that in the present situation we are ready for such a scheme of rates and methods of distribution?

Mr. Doherty: Yes, sir; I do. I think it should have been done a long time ago.

Mr. Jackson: Does that involve, Mr. Doherty, the relationship or percentage of division between the pipe line company and the distributing company you mentioned this morning?

Mr. Doherty: Not necessarily. We have made that division, believing it was a fair division. That is up to the distributing companies to say from their standpoint whether it is a fair division, and it is up to the commission, perhaps, to sit as a referee and determine. I know that some of the distributing companies would say "No division is fair unless we get 99½ per cent of every bit of money that is collected from the consumer." Now, we want to be fair. We don't want to be doing business

with a lot of distributing companies that haven't got the money to maintain their property. We want to see the distributing companies taken care of, and well taken care of, and we want the commission to do that, and we believe that by doing that the commission will best serve the public. We believe nothing is so detrimental to public interest as to have a public service without proper credit and without proper revenue. I would like to illustrate the matter with the railroads. I was living in Wisconsin when they first started to make the railroads a political football. I tried to talk against it and urged that it not be done, as a matter of wisdom. I thought at that time it was just going to crucify our particular state. I saw that movement go on and on and, in my opinion, for every cent that was saved to the wage earners of this country by the drastic regulation of railroads, I believe it cost that same class of people at least ten cents—for every penny they saved up to the time the war came. With a rapidly growing country, we had more and more mouths to feed, more people to shelter. We stopped all independent railroad building throughout the country.

That policy would have lost us the war, if another lucky stroke hadn't come along, and that was the rapid development of the internal combustion engine for motor cars. That meant instead of getting our power by using our farms to raise horse feed, we got our power by the use of gasoline and the land that used to be used to raise horse feed was used to produce food for ourselves and allies, but I really believe that drastic regulation of railroads would have lost the war if it hadn't been for that one thing. For every cent the public has saved on the regulation of railroads, I think, up to date it has lost on a ten-cent basis. We are very anxious to see the distributing companies taken care of. We want to work in partnership with them, and we feel that the interests of the public can only be served by getting those distributing companies back on their feet.

Mr. Jackson: Of course we don't want to be deflected into a discussion of any of those general questions. It must be conceded that there are matters here that must be arbitrated by the commission or courts or someone if the distributing companies and pipe line can't get together on these proportions. Will you repeat just what the percentage was you proposed for the division?

Mr. Doherty: I proposed that the distributing companies would get all of the customer charge, which is \$6; that they would get 20 per cent of the demand charge, which is 32 cents a foot, and 20 per cent of the gas charge.

Mr. Jackson: That is, the general consumption charge?

Mr. Doherty: The last two. One is the demand, the other is the consumption charge. We are vitally interested in the ultimate rate fixed to the consumer and its method of collection. Upon the ultimate rate and upon the ultimate method of collection depends our volume of business. We feel if by any chance that rate does not prove adequate to the distributing companies, the remedy to apply is in advance of the customer rate, say, from \$6 to \$7 or \$8 or possibly \$9, and you men would have it in your power to increase that charge if the rates did not work out as adequate to the distributing companies.

Mr. Jackson: Then that raises the question as to whether this rate as a whole, or scheme of rates that you have proposed and these certain possible increases which may follow to do justice to the distributing companies would be fair to the small consumer, Mr. Doherty. What do you say about that?

Mr. Doherty: I say they are absolutely fair to the small consumer. I see no reason why a man can use you simply as a convenience. You take the small consumer, and he is often simply using you as a convenience. The small consumer is not the small wage earner. As a rule, the small consumer is the man or the family who lives in an apartment house and perhaps has an occasional grate fire or something of that sort—they don't even cook their own meals, and the house is heated by steam, or something like that. If you will go to the books of a company like the Kansas City company you will find the small wage earner is not the small gas consumer. The small wage earner is a pretty good-sized gas consumer.

Mr. Jackson: You think the small consumer would be classed as the light housekeeper?

Mr. Doherty: You might say that.

Mr. Jackson: It would not embrace the washerwoman who uses gas as part of her daily employment or the workman who uses gas to cook and get his meals?

Mr. Doherty: No; you bet it wouldn't. They would be benefited.

Mr. Jackson: Your rate this morning that you spoke of, of 45 cents, if I understood you correctly, was based upon the theory that some other system of rates would be used and that you would have to supply gas as a pipe line company on a theory that it would be used only for cooking. Is that the idea?

Mr. Doherty: That is substantially it. Whenever you get gas rates above a certain point you get over certain critical places—we are not prepared to say just where those places are—and you cut off all gas sold except for cooking and water heating and such things as that. Then the amount of consumption becomes so small that I don't see how any of us are going to avoid carrying rates practically up to the artificial gas rates.

Mr. Jackson: And it would follow, would it, that if satisfactory arrangement could be made with the distributing companies or if this commission adopt this suggestion or some one similar to it that would permit the use for other purposes, a lower rate could be made profitable to the pipe line company at the gates of the city?

Mr. Doherty: We can't conceive of any condition—I can conceive of nothing in the nature of a straight rate, the company selling at the gates of the city and the distributing company then taking the gas and selling it to their customers, that won't bring about such curtailment in consumption that we will be compelled in every event to charge 45 cents, because we soon get to the point where the 45 cents is not compensatory. As soon as our consumption goes down to a certain point we have crossed the 45-cent line and need more and more and more, and there is no use to ask for more because when you get above 45 cents, which would be the equivalent of 27 cents for artificial gas, then it is time for the gas company to step in and say: "We insist on having a right to manufacture artificial gas." Then we know from experience when they manufacture artificial gas nobody ever sold. I guess—I am speaking now from memory—the only thing I can recall is the sale of 42,000 feet per meter. When you get to sales of only 42,000 feet per meter your price has to be very high. When we talk about 45 cents, it is because under any condition we need 45 cents to make it compensatory, and as our consumption goes down in these cities, the 45 cents comes farther and farther away from being a compensatory rate, and we simply crucify ourselves in endeavoring to get more.

Mr. Jackson: Under this Chamber of Commerce scheme of rates, what would your pipe line company get out of that? Forty-five cents?

Mr. Doherty: Oh, no. They wouldn't get anything like that. They would get a big volume of business.

Mr. Jackson: It would be a much less rate?

Mr. Doherty: Oh, it would be a much less rate. that, maybe some of the rest of them can.

Mr. Jackson: You spoke this morning, or Mr. Brown did, I am not quite sure, about this division of rates between the pipe line companies and the distributing companies and the change of the system of business. One of you, I have forgotten which, saying that you didn't wish to force that system upon the distributing company. Now, what have you to propose along that line, I mean along the line of dividing in a reasonable way the leakage, as it has been done in the past? If you can't answer that, maybe some of the rest of them can.

Mr. Doherty: I am the one to answer that, because it is a question of policy. My idea was to sit down and talk it over with you men on the commission and talk it over with the distributing companies, and find out what we ought to do with them in disposing of this rate problem. It is so revolutionary to throw all that over. On the 45-cent rate we are trying to get all we can; we are doing it of necessity and not of choice. If we are compelled to go in and try and salvage our property, that is what it amounts to unless we can get some solution of this problem. Now, if we are going to salvage our property, there is only one thing to do, and that is, get the maximum rate the distributing companies can afford to pay and let them take care of their own leakage. If they want to work with us, and we are going ahead to do something more, then we are willing to make sacrifices for the future, and if we are taking, for instance, this Chamber of Commerce plan, one suggestion I would make would be this, that our company continue to stand the leakage at present just the way it is, and we eventually would be willing to stand as much as 200,000 feet of leakage per mile of main, giving the distributing companies twenty-four months, we will say, to reduce their leakage to 200,000 feet per mile of main or else pay whatever excess they had of 200,000 feet per mile of main; therefore, the excess leakage above 200,000 feet per mile of main would be paid for by the distributing company, one twenty-

fourth the first month, two twenty-fourths the second month, and so on, with the idea that at the end of two years they would have had time—they would be able to start out right now lessening their leakage and at the end of two years should have their leakage well under 200,000. That would mean we would stand the leakage until they had time to cut out the excess leakage. As they would be buying the gas and getting 20 per cent as their profits, their leakage would only cost them at the rate of 24 cents, so if they didn't have their leakage down to 200,000 feet per mile of main—say they only had it down to 400,000 feet per mile of main—now, we would give them an allowance of 200,000 feet, leaving an excess of 200,000 feet, and, as a rule, you have about fifty customers per mile of main on an average basis. That would give them 4,000 feet per customer, and they would have to pay us 96 cents per customer out of their portion.

Mr. Jackson: Per month?

Mr. Doherty: Per year.

Mr. Jackson: You mean by "mains" all of the pipe lines within the city used for distribution?

Mr. Doherty: Only the main lines, not the services, and when we say "mile"—this expression I used is an old term that comes down in the gas business and is as old as the business; that is, a mile of main on the three-inch basis. One mile of six-inch would be two miles of three.

Mr. Jackson: Would it include anything smaller than three inch?

Mr. Doherty: Yes; if you have six miles of two, it would be four miles of three.

Mr. Jackson: Everything except the service pipes?

Mr. Doherty: Everything except the service pipes.

Mr. Jackson: I would like to go back just briefly to the question of supply, Mr. Doherty. What do you think about the supply for this next year? First, have you a sufficient supply to make this Kansas City Chamber of Commerce plan practicable?

Mr. Doherty: Yes, sir. I think we have.

Mr. Jackson: Are you speaking now for both the Kansas Natural and the Wichita Natural?

Mr. Doherty: Yes, sir.

Mr. Jackson: Do you want to hazard a statement now as to the amount of gas you will be able to produce and sell?

Mr. Doherty: Assuming we were to act on the thing now—I will say this: If the thing was acted upon now, we would have enough gas by the time the demand was here to take care of it amply.

Mr. Jackson: That would be for the coming year and for a year or two afterward?

Mr. Doherty: Let's take care of this coming year and I think we can beat the demand; that is, we will get to it—we will bring in the gas and fix up our transportation lines, etc., faster than the demand comes on us.

Mr. Jackson: You are speaking, of course, now of the natural gas alone?

Mr. Doherty: Yes; although I do think some steps ought to be taken to commence to create immediately artificial gas plants on this system up to a reasonable degree.

Mr. Jackson: Mr. Doherty, we have heard it stated very frequently that if we ever go to the basis of where this gas may be used for heating purposes as well as cooking, that the demand in Kansas City alone is practically unlimited. What do you say about that?

Mr. Doherty: I don't believe the demand in Kansas City would increase very fast, due to the fact that gas has got such an unreliable reputation. Eventually we would have a very large demand for gas in Kansas City, but it would be after two or three years of reliable supply, in my opinion. In other words, I think the business on all of these systems has been very badly crippled by the failure to have a proper supply and we won't immediately have that demand put on us just as soon as we have an adequate supply, but it will come on gradually.

Mr. Jackson: Are you prepared to hazard a statement as to how much you would have to produce for the two Kansas Cities this coming year?

Mr. Doherty: No, I would not feel safe in doing that without conferring with our men on it. In other words, I am not well enough advised on it to feel like talking on it from the witness stand or in specific terms, but I will state this guess—that if we could get an adoption of a plan where we are all working together, I will say positively that there will be no shortage in gas. We will beat it to it on the drilling. We have lots of property; we can do inside drilling on it, and, if necessary, we can throw in additional pumps.

Mr. Jackson: Are you prepared now to hazard a statement as to how the supply for this next year will compare with the supply for the year just past on either the Wichita Natural or Kansas Natural, or both?

Mr. Doherty: Well, I think we will have just as much this year as we had last. We will have one witness here, Mr. McCune, who will be prepared to talk on supply, etc.

Mr. Jackson: You realize, Mr. Doherty, that on the Kansas Natural system, at least, that gas was not used at all, presumably not, at any rate, for furnace heating during the last year?

Mr. Doherty: Oh, but it was. There never has been a time that enormous amounts of gas have not been used in Kansas City for heating purposes. We went over that very carefully in this Chamber of Commerce investigation.

Mr. Jackson: That was made, however, Mr. Doherty, before this last year.

Mr. Doherty: Yes, but it was made when the city of Kansas City was paying a 60 cent rate and at a time when I don't know whether it was a crime or misdemeanor to be found using gas for heating purposes, and yet they were using, roughly, about four times as much gas as they would have used if the use had been confined to the legal, legitimate purposes.

Mr. Jackson: Were they using it, or were they wasting it?

Mr. Doherty: No; it was being used.

Mr. Jackson: That is meter tip measurements?

Mr. Doherty: Yes, the meter measurement even shows that. They would have been using a little less than 18,000 feet of gas per customer if it had been used only for lighting and cooking, but, as it was, they averaged for the past year, I think, about 58,000. The increase in rate has brought it down now, so the Kansas City officials tell me it will be less than 50,000.

Mr. Jackson: There is an impression quite prevalent, I think, especially among the gas men, that the 80 cent rate was largely responsible for the supply of gas last year?

Mr. Doherty: It was partially responsible. There is no doubt about that.

Mr. Jackson: That is based on the theory that there was very little, if any, used for furnace use in any of these northern cities. Do you think that is correct or not?

Mr. Doherty: Well, a good deal of it has been used and

you must remember that the adoption of this rate immediately discouraged the man who has a big demand. He would come off. We can get a very large quantity of gas to all of these cities, but we can't supply an exceptionally large demand. The adoption of this rate would tend immediately to drive off the lines those consumers who give you a very excessive demand. It is nothing at all, Mr. Jackson, to have a situation where people ordinarily use some other form of fuel for heating their houses—they may even have a flat heated with steam heat supplied with coal from the basement, but when the exceedingly cold weather comes they hop onto the gas supply, and the only time they use any gas at all is the very coldest day in the winter—that kind of a customer would not be encouraged by this kind of a rate. He would pay for not to exceed fifty hours' use per year. I am not quick at figures, but I would say he would pay at the rate of about \$7 per thousand, and I am very confident that by the adoption of this rate and adoption of it immediately we could get through the winter on it, and, having got through one winter, that we could then get through every succeeding winter, because we would always have that time ahead of us. During the war period I got very pessimistic about the supply of gas, when we were not even allowed to have steel. That is very different now, because we can get rather prompt deliveries on materials.

Mr. Jackson: It is true, isn't it, that there is a much greater visible supply, if I may use that term, in the gas fields than there has been for the last year or two years, very much more promising?

Mr. Doherty: Yes. During the last year we have had some—that is, the roulette wheel has run our way—we have had some accidental discoveries of gas and they have helped us immensely. They not only helped us out last year, but they will help us out during the coming year, and that will give us time to find some others when that is gone.

Mr. Jackson: You have spoken about the amortization of your property. I hope there will not be any great amount of dispute about the value of these properties, but would you mind telling the commission what, in your judgment, what would it be safe in counting on the life of this gas field to be?

Mr. Doherty: That is one of the questions I could not say yes or no to. If we were working on some plan that would give

us a large volume of gas, I would not hesitate to follow that gas literally to the Gulf of Mexico and bring it up here. If you will give me a big enough gas field on the Gulf of Mexico and will give me a big enough market at Duluth, I will undertake to carry the gas from the Gulf of Mexico to Duluth. Now, give a big enough market up here, a method of developing a reasonable market up here, and a good, steady demand so my pipe line system is not lying idle six months of the year, I will say that these fields will last a great many years; I don't know how many years. They will last a great many years, because that gives me a radius of operation in my fields. I don't have to consider this field as a local field. I can consider all the gas I can pick up between here and the gulf. Now, if the demand is small, our idea would be—you can't afford to maintain this system for a small demand. You can't even afford to maintain it, and I don't know how we would handle it exactly, but our idea would be to salvage it as soon as we could. It doesn't pay to try to handle small quantities of gas in such a huge system or to develop quantities of gas that are going to be marketed in very small quantities. Just how we are going to handle that, I don't know. We know that we can't make the business profitable except with a reasonable volume of gas, and we don't believe it is going to be possible to get a reasonable volume of gas on the rates that will have to be charged, except as we may adopt some different system of charging that does not make the gas rate itself so high.

Mr. Jackson: What do you say about the Osage, Blackwell and Kansas fields? Considering that as a local field, what do you think is the probable life of those fields?

Mr. Doherty: Here is another problem that comes in, and let me speak of that before I try to answer you. When we speak of the life of these fields, does that mean life necessary to supply these cities adequately or give them a partial supply? I would say in three years, even though we are very active in getting what gas there would be in these local fields, we would then start slumping off, having less and less gas to supply the market each succeeding year thereafter. That might exist for a period of twelve years, yet all of the gas taken out of the ground and sold in twelve years from that field would not be more than enough to supply these cities adequately more than two years.

Mr. Jackson: Then, on the latter part of that period, you would have to bring into play, assuming that we adopted the Chamber of Commerce plan, your process of manufacturing artificial gas?

Mr. Doherty: Not just that way, because if this rate was accepted, we would then increase the radius of our natural gas operations enormously, but if we are going to have nothing now except the amount of gas which can be sold at prices which correspond pretty nearly to the price that would have to be had for illuminating gas—and that is where we think we will end—we think it would be a case of going up and going up until we end with about the price of artificial gas—that being the case, our sales would become less and less all the time, so we would not feel like extending our radius of operations. But, given some plan that we believe in, we are perfectly willing, if necessary, to add millions to this investment; that is, we are not afraid to go ahead. You know something about our operations when we took a notion to get in the oil business—we went in. We were the largest producers of refinable oil in the world when the government needed the oil. If we can get on a workable basis, we are perfectly willing on this gas business to bring in all the gas within possible reachable distance, and give, if possible, natural gas to you and your children.

Mr. Jackson: And if the natural gas proves to be lacking, you would supplement it with the artificial?

Mr. Doherty: Yes, and we would not be adverse to starting on an artificial gas plant within a year.

Mr. Jackson: Is there any known process of manufacturing this artificial gas at a figure that will approximate the cost of natural gas? I understood you to say yes this morning.

Mr. Doherty: No, not approximating the cost of natural gas, but we manufacture gas now under normal price conditions; it costs, say, 25 cents to 30 cents in the holder. Now, just a few foolish regulations forced on us, and not at all helpful to the public, add 10 or 12 cents to the cost of the manufacture of that gas. For instance, what do you care, if you are a gas consumer in Lincoln, Nebraska, whether you have a 18 candlepower gas or 11 candlepower? You would not burn any of it in your open tips. The state laws require a supply of gas having a certain candlepower. First, in many cities, more than 60 per cent of

all gas is used for fuel purposes. Of the 40 per cent which is used for illuminating purposes—which is very high—not to exceed 5 per cent of that is burned in open tips, or out of every 100 feet of gas that is sold only 2 per cent of it is sold to be burned in open tips, and if those people who do use that would put on gas mantles they would get several times the illumination they now get from the open tip. Here we are buying oil to enrich 100 feet of gas for candlepower and yet only two feet of it is burned in an open tip, and that two feet ought not to be burned that way. Then, in Lincoln, Nebraska, they tell us we must give them gas of not less calorific value than 600 B. t. u. We can't make that out of the local coal and we have to ship in eastern coal. We say we will submit to any rational standards for the gas we give you. We will give you a good, merchantable gas. At the time this Chamber of Commerce report was up, I was assisting Colonel McRoberts in trying to get toluol for explosives. I was also much in touch with the coal program. At that time the government was encouraging the erection of by-product coke oven plants. I was in hopes if we could have got started in time we could have got a large by-product coke plant in the vicinity of Kansas City.

Mr. Jackson: In figuring this at 24 or 25 cents in the holder, have you calculated a return upon the investment of the plant and all the usual charges that go into production, or do you mean merely the cost of fuel and labor in manufacture?

Mr. Doherty: I don't want to get the reputation, Mr. Jackson, of being a gambler. I am just this much of a gambler that I don't ever remember of taking a gamble that I didn't win, and I can't justify the low price that is quoted here for artificial gas, but you have got a company standing behind you morally that has been built up out of practically nothing; that was started as a small company less than nine years ago; that is now worth in excess of \$300,000,000, and we intend to carry this thing out.

Mr. Jackson: Is that the Empire?

Mr. Doherty: That is the Cities Service Company, although the Empire itself, I would say, would be worth \$300,000,000, and they didn't make it in the natural gas business.

Mr. Jackson: You took other chances than the one chance?

Mr. Doherty: We have taken what people thought were repeated chances, but our gambling has never lost us money. We

go in and find out what we think we can do, and when we get ready to do a thing we are ready to do it on a very aggressive scale.

Mr. Jackson: Mr. Doherty, you have some idea about what the extensions and explorations to produce gas have cost since you have been interested in the Kansas Natural—I, probably, had better say both the companies. Can you tell the commission what that amount has been?

Mr. Doherty: The amount we have spent for exploration and trying to maintain that supply? You will have to get the accurate figures from the men who have been called in to testify accurately to it, but it has been considerably over \$2,000,000 a year, I think. In this particular case, instead of trying to coach myself up accurately on a great deal of this information, I thought it would be better to have the accurate information brought out by a man like Mr. Hamilton, who has had the experience on that part of it.

Mr. Jackson: Could any of that cost be justly attributed to the exploration for oil?

Mr. Doherty: No, I don't think so.

Mr. Jackson: You think that is chargeable to the gas alone?

Mr. Doherty: In fact, I think we could justify a much greater expense than that.

Mr. Jackson: Have you built and maintained any permanent pipe lines out of that and lines that could be considered valuable as pipe lines?

Mr. Doherty: I think our mileage would constantly show a greater mileage. In fact, I know it would, but how much you would treat as capital account or just maintaining a supply, I don't know, but even if you did have more miles, here is this plant with less supply than it ever had (except possibly a temporary increase in the supply) and yet with millions more in the property.

Mr. Jackson: Would you want to state, Mr. Doherty, what is actually, generally speaking, of course, the lowest holder cost for gas that you are now manufacturing artificially?

Mr. Doherty: I don't believe we are putting it in the holder in any city now for less than 30 cents a thousand. Of course, you understand that has nothing to do with this, because that is that foolish gas we are making.

Mr. Jackson: You mean the gas made under those state regulations?

Mr. Doherty: Gas made under standards at the time when we had no incandescent burners.

Mr. Jackson: Does that involve war prices?

Mr. Doherty: Prices are about as high now as they were during the war. They slumped off a little after the armistice, but they are going up. I don't think we are putting it in the holders in a single plant at less than 30 cents.

Mr. Brown: Does that include the by-products?

Mr. Doherty: That includes the by-products and everything else. It is still above 30 cents.

Commissioner Green: Judge McCune, do you want to cross-examine Mr. Doherty?

Mr. McCune: General Jackson has pretty well covered the ground. There are one or two questions I would like to ask Mr. Doherty. I represent the distributing companies of Newton and Hutchinson. Last April, I think it was, we received notice from the Wichita Natural that after a certain date the price of natural gas to us would be 45 cents at the city gates and that unless we paid that amount the supply would be cut off. I understand to-day that you are suggesting two rates. You are still suggesting that if we have a city boundary rate it must be 45 cents. Am I correct in that?

Mr. Doherty: Yes, sir.

Mr. McCune: So that the notice stands as it was given unless we can, with the consent of the commission, agree upon this three-part rate? Is that correct?

Mr. Doherty: Yes, sir.

Mr. McCune: And am I correct in understanding that the suggested rate that you are making here is a proposed rate that you are willing to give to the distributing companies?

Mr. Doherty: Yes, sir; we are. We are perfectly willing to go ahead with this Chamber of Commerce report and plan.

Mr. McCune: You have had here this Chamber of Commerce plan, and, as I understand, the rate you are proposing to give the distributing companies is the rate found on page 23 of this printed report with reference to natural gas?

Mr. Doherty: Yes, sir.

Mr. McCune: Do I understand that that is as far as your

proposal goes now? This other proposal as to artificial gas has nothing to do with this case?

Mr. Doherty: Yes, it has. One is conditional upon the other. We want to know, if we are to build up a big natural gas system here, that it will have no artificial death date—that we can always use what is there so long as you have fuel of any sort.

Mr. McCune: I notice on page 23, subdivision "C," reading from this report, "When an adequate supply of natural gas, supplemented by artificial if necessary, has been created, the Doherty companies offer the following binding contract." Now, that was a conditional offer at that time—"When an adequate supply of natural gas has been created." Do we understand you have now that adequate supply?

Mr. Doherty: In our judgment, we have sufficient supply to inaugurate this plan if it was done.

Mr. McCune: Do you object to having this report in evidence?

Mr. Doherty: No, no. Anyway, they want it in. You asked a question in regard to Section "C." The point I wanted to correct was this: that Section "C" here was not—that there was already a binding contract and a binding plan and a continuing plan before these rates went into effect, because we had agreed with the Chamber of Commerce that there would be first introduced a rate of \$6 plus 80 cents, and we would not take any money out of the property until we had built up an adequate supply, and when we had built up an adequate supply we would then have these rates. I wanted that to be understood so the record would be straight on it.

Mr. McCune: How much of this paragraph "C," assuming that this report is in evidence, how much of this paragraph "C" should be considered as embodying your proposition here at this time for the consideration of the distributing companies and of the commission?

Mr. Doherty: I am ashamed to say I am not quite clear about your question. Do you mean to say is this open now and is this an offer?

Mr. McCune: I thought possibly in the interest of a clear proposition that you could indicate how much of that printed report could be taken into consideration now as being your proposal here at this time to the distributing companies.

Mr. Doherty: With just a few places where I would word it differently, the whole thing just as it stands. We will go farther than this and allow—under this plan it was contemplated, as I remember it, that the companies would pay for all leakage, but under this arrangement we will allow a leakage up to 200,000 cubic feet.

Mr. McCune: As you have already stated?

Mr. Doherty: Yes.

Commissioner Green: This pamphlet will be considered as a part of this record and marked "Doherty Exhibit 'A,'" so it will be in the record.

Mr. McCune: Just one other question. I am not clear as to the method to be adopted in determining any certain consumer's demand charge. I understood you to say awhile ago that a consumer could buy any number of feet he wanted to and that would fix his demand charge. How often can he exercise that right? Must he do that once a year, or can he take a period during the summer when he doesn't want any house heat—

Mr. Doherty: He must contract for a year. This is the way we work it in our electrical properties: Let us assume that it is you. You come in and say, "I want a contract for a demand of 50 cubic feet." We make out your contract and your readiness-to-serve rate is based on a demand charge of 50. We put on a limiting device that holds you down to 50. You can come in later on and make a new contract, saying "I want 100 feet. That is inadequate." You can't curtail your demand during the year. In other words, you can't come in and contract at the first of December and then the first of February reduce it.

Mr. Brown: But you can take more.

Mr. McCune: That would defeat the purpose of this rate.

Mr. Doherty: Yes.

Mr. McCune: When the customer comes in in July and says, "I think next winter I may want to heat my house and I want to contract for demand sufficient to heat my house with my furnace," you will make a contract with him as of that time; then when you make that contract, you use this governing meter, or whatever it is, and fix the maximum amount he can use as the amount necessary to heat his house?

Mr. Doherty: Not necessarily to heat his house. We didn't contract to heat his house.

Mr. McCune: Whatever he says to heat his house?

Mr. Doherty: We contract to give him a certain demand. It is up to him to come around and get more or be cold.

Mr. McCune: I can see where a man would say he doesn't know how much it will take. "I want enough to heat that house." It is going to be up to us to tell him, and when we have told him and he relies on that, aren't we obliged to furnish him that?

Mr. Doherty: No. You are very foolish if you take the responsibility of heating his house on your recommendation of demand. You say, "A house of that sort generally requires 75 cubic feet, but we don't know how you maintain your house. We suggest you contract for 75, and if we are able to give you more when winter comes on and you see what you have to have, you can come in and contract for same." He doesn't have to contract for the full amount if he comes on in the summer time; if he is willing to take the risk of letting winter come on and our contract allotment not being full, he can come in and raise it. A fellow that might take 200 feet demand to heat his house can, by a few weatherstrips, reduce it to 75. This is going to show some economy on the part of the gas consumer. It is going to show on the face of it in two or three different ways where some of the big bills come from and how to cure them. What I am itching to do is to get onto some of this extravagant use of gas out here on the part of the consumer. Here are two houses just alike—one can't be heated on 200-foot demand and the other can be on 75. There is something wrong with the consumer.

Mr. McCune: This is rather new to me, but there are many features that commend themselves to my judgment; but as representing the distributing company, I am a little uneasy about this demand charge. I know in the electric business a man can come in and say, "I have installed certain machinery and must have so much of your electric energy to run that machinery." If we haven't got that energy, we can go and get some. We make a contract to furnish him that demand when he agrees to pay for it. To what extent could you say your company or our distributing company are obligated to supply that demand if we take pay for it?

Mr. Doherty: Taking one phase of your question there, you are able to tell a man what demand he will have to pay for in the electrical business, because you have experience with every

piece of apparatus and know how much it uses. We will soon have that experience with gas. We haven't had it yet. Now, the proposition of collecting for demand and not giving it: Let us assume some shortage comes about and we are not able to live up to our demand. Now, we have to agree on some sort of penalty clause if we fail to supply all the demand we put up. As far as I am concerned, whatever is fair in that matter I am willing to stand.

Mr. McCune: Ought we make some such provision as that, as to what will happen if we don't supply that demand we have taken pay for?

Mr. Doherty: Yes, sir.

Mr. McCune: Ought not that to be incorporated in the proposal?

Mr. Doherty: Yes, I think it should.

Mr. McCune: What would you suggest would be fair in that respect?

Mr. Doherty: I don't know. I know how all of our electric contracts are drawn, but it is a mere matter of avoiding legal responsibility. They were drawn by the central stations and are overly fair to the central stations. They provide for rebating double the amount of the demand charge for such time as the demand is not supplied. It should be more than that, but I am not prepared—we discussed that last night as to what we ought to come in and add to that. We were unable to agree just how that rebate should be figured. You must not overlook this: That demand charge is put there on account of the expenditures made by the company, and even if it is unable to supply the demand, if it is the lopping off of a field, like some of these fields have gone off—like a puff of smoke—the company would still have all of its investment in there, yet the company should have some sort of a demand charge that would act as a stimulant for the company, so nobody will ever miss an hour's supply of gas. You can go into an ordinary city that has natural gas in it and you can sell always a large amount of artificial gas at any price almost, simply because they can't stand an hour's shutdown. For instance, take some of these manufacturing plants that have special types of furnaces, and things like that; suppose they are trying to make a special type of steel. They say, "I can't afford

to fool with natural gas, because it is liable to make me a bad batch of steel." In other words, my idea is to get this natural gas service so it is as perfect as any service there is.

Mr. McCune: Do you think it is advisable, Mr. Doherty, for you to make some suggestion to the commission covering that point before the case is closed?

Mr. Doherty: You mean this matter of rebate?

Mr. McCune: Yes.

Mr. Doherty: I haven't anything to offer. I am inclined to think I could say "yes" to anything anybody else could offer.

Mr. Jackson: I am not sure but our state law, passed last year, might have something to do with that.

Mr. Stone: That is based on pressure only.

Mr. Jackson: Would this come to about the same thing?

Mr. Doherty: You couldn't have a failure of supply without a failure of pressure.

Mr. Jackson: However, it is left largely to the judgment of the commission. I think it would be easy for the commission to frame rules.

Commissioner Huggins: So no arrangement between the distributing company and producing company would be necessary. However, it seems to me an arrangement between the companies would be a good thing.

Mr. Doherty: It isn't so much between the companies as it is between the consumer and the company. It is a matter now of the consumer having redress if he doesn't get the demand he pays for.

Commissioner Huggins: But the consumer can only look to the distributing company, because his contract is with the distributing company.

Mr. Doherty: If they can get only a portion of the collections, they get their penalty.

Mr. Brown: Don't you think we can get together with the distributing companies?

Mr. Doherty: Oh, yes. If we get the spirit of get-together we can agree.

Mr. McCune: The proposed division of the money between the two companies is not included in this printed report.

Mr. Doherty: Yes, that is included in the printed report.

Mr. McCune: If it isn't, we are to understand that the sug-

gestions made here by you are also in the nature of a proposal that you are willing to make to the distributing company?

Mr. Brown: You will find that on page 28. One hundred per cent of the consumer charge and 20 per cent of the other two charges on the natural gas rate.

Mr. McCune: Except that the distributing companies are not to stand all the leakage?

Mr. Doherty: We will allow 200,000 cubic feet per mile of main on the three inch basis, and we will probably ask the commission to eventually make that allowance, not per mile of main, but per customer.

Commissioner Green: Is there any other distributing company receiving a supply from the Wichita Natural, represented here, that desires to ask any questions of Mr. Doherty?

Mr. McCune: I suppose, Mr. Doherty, that will be the basis of division to be made between your pipe line company and your distributing company—the Western—that would be a good indication of what you think is fair between your own two companies.

Mr. Doherty: I think that is fair, but if it isn't fair, we want to try to work out something that is fair. I think I can convince anybody that approaches it from the right angle that that is fair, and I am quite sure if that person approaches it from the right angle and it is not fair, I can be convinced that it is not.

Commissioner Green: Are there any representatives of the cities served by the Wichita Natural that desire to ask any question of Mr. Doherty?

Mr. Jackson: It has been suggested about this service charge of \$6—that is supposed to be arrived at from a scientific basis, is it not?

Mr. Doherty: No. I think if we had apportioned all of the customer charges, if we had made a strict apportionment of the customer charges—of course, a great deal of it is a matter of opinion—we would have arrived at a little larger customer charge and a little smaller demand charge. We adjusted the rates partially as a convenience, and we fixed on \$6. I think our customer expenses, the definite customer expenses, amounted to something a little over \$8.

Mr. Jackson: Really, it ought to be fixed upon the expense, ought it not?

Mr. Doherty: It ought to be fixed on the expense, I think, but that \$6 partially reflects the views of the committee of the Chamber of Commerce. They liked the idea of a \$6 charge better than a \$9 charge.

Mr. Stone: If your honors please, I represent the receiver of the Kansas Natural and am here only on his account. There are a couple of questions I would like to ask.

Mr. Jackson: Let me ask one more. A situation where there is a local supply of gas around some of these cities has been called to my attention. Of course, in those vicinities there would be no objection to making the general consumption less than in some distant cities where the transportation was greater, would there?

Mr. Doherty: I should think we could properly modify that, but I would not want to go on record completely at this time for fear there is some angle to it I do not see, but they have always been given a distinction.

Chairman Kinkel: Mr. Doherty, if this readiness-to-serve or customer's charge of \$6 does not cover all the actual expenses involved in that matter, shouldn't it, as a matter of equity, be increased to that point where it does cover those expenses?

Mr. Doherty: Yes, strictly, it should, Mr. Kinkel, but sometimes when we have asked for something approaching exact equity they wouldn't even go a little ways with us, and I was keeping up my sleeve this idea—the production company and transportation company are naturally interested in what the rate is to the final consumer and as to how it is charged, because on that depends his volume of sales. If you get the rate too low you can drive us all over the map finding gas. If you make it too high you make it impossible to support our pipe line. So we have a vital interest in the price made to the final customer and how it is proportioned. I know many of the distributing companies will come along and say: "We couldn't live on that method of selling unless we get 99½ per cent." That is where they will start. I think the rates provided are ample, but if they are not I was going to suggest they come back later and ask to be taken care of by an additional customer charge of not over \$3. You certainly would have something approaching more nearly exact equity if you made the customer charge exactly whatever the expenses are, but here is the situation in this matter of ex-

penses: The company has a lot of expenses—it is very difficult to tell how those ought to be apportioned. I have always used a certain division; that is, those expenses which were definitely chargeable to a certain thing, then you have got a great mass of other expenses which are indefinite. For instance, your manager's salary is more or less indefinite; this, that and the other—it is a matter of judgment where you place it. I have always tried to make rates in this way, that every branch of the service should bear for every division of the service a charge that at least covers all of the division expenses, and then you should not attempt to place any of the indefinite expense, this expense that cannot be allocated to some particular thing, you should attempt to place no more of this on some particular feature of the service than it will stand. That is, you apportion your indefinite expenses arbitrarily. I don't remember just how we arrived at the figures or what the amount was. I think our customer's expenses were \$8.10, as we figured it at that time. Mr. Hamilton has been working on the matter entirely independent of my work, and if I may I will just ask him where he arrived.

Mr. Hamilton: My idea was the customer's charge should be \$9. That is the only place I did differ from your rate.

Chairman Kinkel: Did your actual expenses come just to \$9?

Mr. Hamilton: No two towns are exactly alike, but they run more nearly to \$9 than to any other sum. That would be the only divisible amount in arriving at the amount per month.

Mr. Stone: Mr. Doherty, in reply to one of Mr. Jackson's questions you made the statement that the more gas the individual consumer bought, the lower his rate would be under your proposed schedule. You didn't mean by that that the larger consumer always got a lower rate than the smaller consumer, but that if he took up to his maximum demand, the nearer he came to his maximum demand, the lower his rate would be?

Mr. Doherty: That is what I mean.

Mr. Stone: That is, a small consumer might get just as low a rate as the large consumer?

Mr. Doherty: The small consumer will get just as low a rate as the large consumer will get, but don't forget there is a \$6 customer charge.

Mr. Stone: After equalizing that?

Mr. Doherty: Aside from the customer charge, it is the same.

Mr. Stone: You don't want the impression to get out that this rate would militate against the small consumer and in favor of the large consumer?

Mr. Doherty: Oh, no.

Mr. Stone: The receiver is in a way interested in the answer to this question. Your testimony has indicated that your three-part plan could not be applied if a rate were made by the producer and transporting company at the city gate. As a matter of fact, it might be applied even though the transportation company received a definite city gate rate?

Mr. Doherty: Yes.

Mr. Stone: And is just as applicable, except for this fact that you conceive every transporting company is interested, and vitally interested, in the ultimate rate to the consumer and ought to have something to say on that. Judge Booth has fixed a rate for the receiver to charge at the gates of the city. Although that is done on the Kansas Natural system, still your plan of the ultimate charge to the consumer might be applied, might it not?

Mr. Doherty: Yes.

Mr. Stone: And be just as applicable if you could control the relations and the interest of the producing company in the ultimate rate?

Mr. Doherty: Yes, sir; it could.

Commissioner Huggins: I want to make a remark or two before Mr. Doherty leaves the stand. As I understand it, there is now a proposition that the producing company and the distributing companies get together and figure out a fair and equitable rate and that rate shall affect, of course, the ultimate consumer. Now, when you gentlemen get together in your efforts to arrive at a settlement of this question, would there be any objection to one of our engineers meeting as a representative of that ultimate consumer and taking part in these deliberations?

Mr. Doherty: From me?

Commissioner Huggins: Yes, sir.

Mr. Doherty: I think it would be a good thing if the whole commission with their engineers would sit down with us.

Commissioner Huggins: The engineer would be the proper man to meet with you.

Mr. Doherty: What I had in mind, Mr. Commissioner, was this: Perhaps the presence of one or all of you commissioners

would tend to shorten any tendency toward trading, and we could more quickly get together. I have a very high regard for your engineer, and we certainly would welcome him, but we also would like very much having a member of the commission, or all of them, sit down with us.

Mr. Jackson: I want to call Mr. Doherty's attention to one thing brought out by Mr. Stone. You don't mean to give the impression or understand Mr. Stone meaning that Judge Booth is insisting on this 35 cent rate?

Mr. Doherty: I do not so understand it. I understand this, General Jackson, and I can be corrected if I am wrong. The way the information has been given to me is this: Judge Booth has been urging that we get together and work out some solution of this gas question, and here recently, as there was a necessity for making a rate in the cities, he felt that that could not be done except as he named a rate at the city gate, so he named a rate at the city gate of 35 cents flat, a price we will call 35 cents, and the distributing companies to pay for all of their leakage, but, as I understand it if we tomorrow could agree between the cities and the distributing companies and the commissions, etc., so we are all agreed I understand Judge Booth will let the company do anything in the world. The only thing he wants to do is to get that thing settled and get rid of that case.

Mr. Jackson: That is the way I understand a letter we have received from him. It is true, is it not, Mr. Doherty, that a 35 cent rate flat at the gates of the city would foreclose the hope at all of any industrial gas being delivered?

Mr. Doherty: Yes, sir; it would.

Mr. Doran: Will you be here on the 30th, Mr. Doherty?

Mr. Doherty: I don't see how I possibly can.

Mr. Doran: What I had in mind was this: I am not interested in this end of the controversy, but I am very vitally interested in the Kansas Natural end.

Mr. Brown: Go ahead and ask your questions.

Mr. Doran: Mr. Doherty, does not the application of this customer's and demand charge, or three-part charge, contemplate an adequate supply in all cases?

Mr. Doherty: Yes. It contemplates an adequate supply.

Mr. Doran: And that system is intended to induce sales, is it not—larger sales of gas?

Mr. Doherty: It is intended to induce large sales of gas with a small demand. Large quantities of gas sold during the year is not the problem that makes it difficult for us. It is heavy demands. We intend to reduce demands by making people pay for their demands.

Mr. Doran: And this plan is so framed that it induces the consumption of gas and electricity?

Mr. Doherty: It induces maximum sales.

Mr. Doran: It is the result of the greatest genius of the experts for that purpose, is it not?

Mr. Doherty: Yes.

Mr. Doran: Now, on the Kansas Natural system, do you feel, Mr. Doherty, that you either have the supply or the capacity to supply an adequate demand for these northern Kansas towns for heating and cooking?

Mr. Doherty: If these rates are adopted we will provide an adequate supply. We ourselves are owners of large gas

There are many roads that lead to success but the man is not likely to find them who gave up the search because he once turned into a blind alley.

—HENRY L. DOHERTY.

properties in Texas. We are willing to go to Texas for gas if necessary, if we just know we can carry gas with practically a full pipe all the time and not have to provide a pipe that is only used one or two cold days in the year.

Mr. Doran: Would you be willing to guarantee a supply for cooking and heating in Topeka if your plan were adopted?

Mr. Doherty: Most certainly not. No sane man will go on any such guarantee as that. We are willing to guarantee to spend ten or fifteen or twenty million dollars to do it, but we can't underwrite God.

Mr. Doran: Isn't that a conclusive objection to this plan? You can hardly demand from a customer in the city of Topeka that he pay a demand unless you have got the commodity to supply the demand.

Mr. Doherty: Say we have got the commodity to supply the demand when we make the contract with him, and say later

on we fail. Now, he is entitled certainly to a certain rebate, but not 100 per cent rebate, because the company has spent its money to get the supply.

Mr. Doran: If you made a provision of that kind, it would be a guarantee in effect.

Mr. Doherty: I would be perfectly willing to make a provision that a certain rebate shall be given the customer.

Mr. Doran: Don't you feel that it has been demonstrated that the capacity of the Kansas Natural lines is inadequate to carry the supply if you had it?

Mr. Doherty: All right, then; we will make them adequate. I don't think it is, but whatever is lacking we are prepared to do.

Mr. Doran: Even when we had the greatest supply your lines ever provided in ordinary times, we were short in winter months when it turned cold.

Mr. Doherty: You weren't short last winter.

Training others to take your place does not endanger your job in one organization but is more apt to be the sure road to advancement.

—HENRY L. DOHERTY.

Mr. Doran: We were advised by the management of your company that that was due to the fact that it wouldn't go through the line.

Mr. Doherty: We have never yet had charge of the Kansas Natural Gas Company, but with the litigation out of the way and an agreement between the distributing companies, we will have charge of it, and then I say to you that the matter of transportation of gas is merely one of investment, and with this solved along the proper lines we are willing to make the investment.

Mr. Doran: But there would be a physical impossibility to get it here for this winter?

Mr. Doherty: I maintain that if you pass this thing at once we will have the supply for you for this succeeding winter and every succeeding winter.

Mr. Doran: I wish I could convince my powers of reasoning that that is true. I don't want to argue with you.

Mr. Doherty: Let us assume this: Let us assume we would have a little more shortage than we did last year; it would not be any serious thing compared with what we have gone through with. It would be nothing, compared with the benefit of having this settled and the ability to increase the supply for years ahead.

Mr. Doran: Now, under this 45 cent rate, that takes into consideration the amortization of your plant within a given number of years, does it not?

Mr. Doherty: Everything we can get; we are going to reduce our investment to that extent.

Mr. Doran: On the basis of the 45 cent rate, have you taken into consideration the value of the properties of the distributing companies and their needs?

Mr. Doherty: No, I have not. I feel now that with the court decision holding that we are interested only as to the gate rates, that you distributing companies—and that is what I fear—that you can force whatever rate is necessary to enable you to earn a reasonable return on your investment, and that carries the rate so high that it forces us to have a 45 cent rate for us.

Mr. Doran: That is just what I am getting at. Now the 45 cent rate takes care of your property at the city gate, but do you know what effect it has on the distributing company's property?

Mr. Doherty: It will require you to collect whatever rate is necessary if you can get it through by legal means, to give you an adequate return. I think this whole gas situation is going to end, and it won't be very long until the customers will be paying \$1.50 a thousand.

Mr. Doran: I am dreadfully afraid you are right, but I hoped somebody with the genius and knowledge of affairs like yourself would help us out of it.

Mr. Doherty: Nothing but constructive work will save that situation.

Mr. Doran: Does your proposed three-part rate and the division of the stand-by charge take into consideration the needs of the distributing companies and what it will earn for them?

Mr. Doherty: Yes. I would accept this contract if I were a distributing company and had nothing to do with the supply company. What is more, I would accept that division for the

distributing company in preference to anything they have ever had.

Mr. Doran: But in doing that, would you not have to know what the supply was going to be?

Mr. Doherty: Well, what we are ready to undertake, Mr. Doran, is this: Failing to give you a supply of natural gas, we give you a supply of artificial gas.

Mr. Doran: You mean the Doherty interests are going into the manufacture of artificial gas?

Mr. Doherty: Yes, sir.

Mr. Doran: That contemplates the taking over practically of the distributing companies' properties, does it not?

Mr. Doherty: Not at all.

Mr. Doran: You deprive them of the right of going into the business if you do it.

Mr. Doherty: Not if you can go in and do it cheaper than we can.

Mr. Doran: That is just what I wanted to develop. If you undertook to do such a thing as that, or if we did—I mean by “we” the distributing companies—the creation of an artificial manufacturing plant as a sort of stand-by for this natural gas business would involve the expenditure of a large sum of money in Topeka, in all probability between \$300,000 and \$500,000. That would have to lie idle a large part of the year if the supply of natural gas was adequate to meet the demands of the people and would be an additional burden upon the people and on which they would have to pay return—it wouldn't make any difference whether you made that investment, or the distributing company.

Mr. Doherty: It would make a lot of difference. If every distributing company had to make its own reserve capacity in artificial gas, it would be like every merchant on the street keeping his own bank account in his own till. If it is done by us we can locate our artificial gas plants at those points where we can make gas the cheapest, and we can make gas at any point on the system and relieve the balance of the system. Your point is this: “If you would go into this business you are competing with us. We thought when natural gas was over we would have a right to go back to the artificial gas business.” If you can make it for each of these plants, and make it as cheaply as we can, of course we can't ask to do it, but in my

opinion you can't do it, and that is one of the values to the public of the centralized system.

Mr. Doran: Is it your theory you can make artificial gas lower than the distributing company?

Mr. Doherty: Yes.

Mr. Doran: If you carry that out, it means the centralization of all these plants under one interest and one control. You will fix not only the price to the city but also to the consumer.

Mr. Doherty: We fix it to the consumer only by agreement.

Mr. Doran: But when a person is helpless it is easy to get him to agree. If we are surrounded by conditions where we have natural gas part of the year and artificial gas part of the year, furnished by an outside company that is liable to come in and underbid us at any time, it would not be very difficult to drive us out of business any time and take over these plants at a small cost. That is a thing we probably would not like. Would not your scheme tend to that result?

Leadership which asserts itself by its own power must be recognized, no matter from what source it comes.

—HENRY L. DOHERTY.

Mr. Doherty: Not at all. As far as we are concerned, Mr. Doran, that is as far as our firm is concerned; certainly you know that we would not attempt to drive any of these companies out of business or force sale of their property. We have never done any of that kind of business.

Mr. Doran: I am not accusing you, but if you had such a system as that in existence, might that not be a strong possibility for somebody else to do it?

Mr. Brown: That would not create any more of a monopoly than the ownership of the natural gas itself.

Mr. Doran: To a certain extent it does. When the natural gas was brought to Topeka our predecessors in office signed a very foolish contract.

Mr. Stone: Are you willing to give it up?

Mr. Doran: We have given it up years ago. We were forced to sign an improved contract. On that basis, Mr.

Doherty, do you figure that the distributing companies are cared for on this three-part rate with a \$6.00 customer's charge and 32 cents a foot demand charge and a 30 cent gas charge? On what basis have you figured the value of these companies and their needs and returns that must come to them and how this three-part rate takes care of their needs?

Mr. Doherty: Well, Mr. Doran, I have tested it by taking St. Joseph—the valuation per customer; then I worked out what I believe to be the revenue to the distributing company and tested it out in that way to see if it was ample, by taking that sort of valuation, the known operating expenses of companies we operate, and it did seem to me to be ample and would give them a nice return on the investment.

Mr. Doran: You haven't got the figures you applied to that particular plant?

Mr. Doherty: No. But it is simply a question of taking two or three things. First, you have to assume, if you have an

There are always some who have a love of trying for a prize, not for the sake of the prize, but for the love of the game.

—HENRY L. DOHERTY.

adequate supply, how much you can sell.

Mr. Doran: I wish to concede right now if you had an adequate supply I would be for the adoption of your rate. Our engineers advocated the adoption of it three years ago, and I wrote a brief on it, but that was on the assumption of an adequate supply. It has always been our theory that you could not have such a rate on an inadequate supply, and, Mr. Doherty, it is our experience that you have never been able to give us an adequate supply in the last six or seven years.

Mr. Doherty: I never have had a chance to do it yet.

Mr. Doran: I mean the Kansas Natural. I beg your pardon.

Mr. Stone: Mr. Doherty, your plan would tend to reduce the peak load in the winter, would it not?

Mr. Doherty: It would.

Mr. Stone: And the large furnace consumers you apprehend would not be on the line?

Mr. Doherty: Not in the coldest weather.

Mr. Stone: Because, by fixing their demand at such a sufficient amount that they would have to pay too high a rate for the rest of the year, they could not economically go on, and that reduces the extreme demand in the cold weather in the winter?

Mr. Doherty: That is right.

Mr. Stone: So that meets Mr. Doran's suggestion that you would not be able to meet the ultimate demand, or maximum demand, in the winter time?

Mr. Doherty: That does. It is the demand we have a hard time meeting, not the total amount of gas.

Mr. Stone: Is it not, as a part of your proposition, necessary, so far as the Kansas Natural is concerned, that these old supply contracts be surrendered and the new contract made in their place?

Mr. Doherty: This contract must prevail so there could not be any old ones.

Mr. Stone: So the supply contracts Mr. Doran speaks of would have to be eliminated?

Mr. Doherty: Yes.

Mr. Matson: How would the company protect itself against a consumer who entered into a contract during the cold season of the year when he had the peak load? How would the distributing company protect itself against that sort of consumer?

Mr. Doherty: He has taken a firm contract that he will pay those readiness-to-serve charges for a year. We have never had a bit of trouble with that. We have been using this rate for years. Occasionally we have to compromise with a customer. We always let him off if it is something done in good faith.

Mr. Matson: You would not suggest a deposit?

Mr. Doherty: Not in those cases unless where it is plainly an unreliable customer. If you lost every one of those cases you wouldn't lose much. As a rule, the credit strength of a public utility is that they must come back and do business with you. When they come back they must pay up all past claims.

Mr. McCune: Mr. Doran calls attention to this division for artificial gas. I didn't get the idea that in this proposed contract you were going to require the distributing companies to enter into a contract at this time to take artificial gas from you if you could not supply natural gas. Is that the meaning of this clause,

that we must make contracts now for artificial gas at the time we make contracts for natural gas?

Mr. Doherty: Yes, that is it. Let me explain that to you, Judge. It is only possible for us to quote the lowest rate on a delivered quantity of gas by avoiding an artificial death date for our property, and if we must have a death date for the property ahead of the time the property wears out, you are bound to have a higher cost. There is only one way you can avoid an early amortization date for the property, and that is providing how continuation can go on beyond the natural gas period, nor would we be warranted in making additional investments in gas in this field—I have had enough of this field unless I could supplement that with this arrangement for artificial gas supply.

Mr. McCune: I am glad I asked you that. I am not saying it is not all right, but I hadn't understood it. You are proposing to bind your company, in case natural gas fails, to build an artificial gas plant and supply artificial gas at these prices, and on the other side the distributing companies must bind themselves to go on and take artificial gas at the other rate if your supply of natural gas fails? Is that right?

Mr. Doherty: That is right.

Chairman Kinkel: How long must they do that, Mr. Doherty?

Mr. Doherty: I would not ask for a very long term contract; just if the different cities didn't all come off the lines at the same time. In other words, my opinion is that there will never be a time they won't want the supply, but I would prefer to make contracts with them at different numbers of years. I don't know how is the best way to work that out. I am not afraid but what they will want to cling to this method of doing business, once we get it established. I don't know but what in their specific contracts—if they have any particular reason why they don't want an individual contract, I don't think we would be so awfully anxious about it.

Commissioner Green: If you can supply them with artificial gas cheaper than they can make it themselves, you are not afraid you will lose your customers?

Mr. Doherty: Yes, sir. I think we will have the same advantage over each local distributing company which we would have as a bank over the man trying to play banker for himself. When

we commence supplementing the natural gas supply, I think our investment would be enormously less. We can locate our plants to get the lowest cost of production and I am not sure but what I could say, "Gentlemen, you won't have to give us any contract. We will stand on our economic advantage."

Chairman Kinkel: Have you any idea where your artificial gas plants would be located?

Mr. Doherty: They will be more or less scattered because we will locate them, I think, in the place of the highest priced byproduct market rather than the lowest priced coal market.

Mr. Stone: It is your idea that the plan to be agreed upon would be fixed or subject to readjustment from time to time as conditions might change?

Mr. Doherty: When I drew this thing up first, it was simply to use this as a plan to go to work on, and it would be subject to change from time to time. I think we would be satisfied to work on it in that way.

Teach your employees not to bear ill will for their fellow employee for it interferes with their own usefulness and therefore their own promotion.

—HENRY L. DOHERTY.

Mr. Stone: Subject to change from time to time?

Mr. Doherty: Subject to change from time to time. In other words, I remember now just how I figured this out at the time, that we would have an economic advantage in every case and therefore would not need the protection in the matter of contracts and things of that sort. Depending upon the obligations that were asked of us, we would ask of others and try in some way to work the plan through; sit down and talk it over and not ask for anything we didn't have to have. I just want to say one word about that reply I made to Mr. Doran about guaranteeing a natural gas supply. Every time I have had any negotiations out here, they have said wouldn't I guarantee the supply. Mr. Doran asked it specifically of natural gas. We can't guarantee a supply of natural gas, but we can guarantee to supplement it with artificial gas, given enough time to do it. You can have a natural gas field give out almost over night.

Mr. Foulston: Mr. Doherty, this plan you now propose is a complete departure from the plan that has been talked of for the last few months, is it not? The plan talked of was along a line, the purpose of which was to fix a rate so that gas would be conserved and would not be used?

Mr. Doherty: We expected to precede this with what might be called a restrictive rate while we were building up a supply. In our opinion, the supply is built up enough now so we don't have to maintain a restrictive rate. The conditions have got so now that if we don't do this, the compensatory rate will be far beyond the restrictive rate, and so far beyond that the problem won't be how to get gas, but how to get enough revenue out of the little gas we sell to do it.

Mr. Faulston: But my question was, there is evidently a change in the entire ends to be sought by this rate?

Mr. Doherty: Not at all. We wanted before—when the rates were away down, we wanted to have rates raised for the

What an ambitious young man can accomplish through his own efforts can be measured only by infinity.

—HENRY L. DOHERTY.

sake of getting—that is, on the Kansas Natural system, we wanted to have rates raised—(interruption).

Mr. Foulston: I am interested only in the Wichita Natural proposition. We were told down there that one of the purposes was the conservation of the gas, that it was necessary to conserve this gas for future generations to burn, and the price was necessary at this time to conserve the supply. That is now abandoned on the part of the company?

Mr. Doherty: No. Not at all. The idea is to conserve gas, not to sell it for a song. The idea is to conserve the gas, conserve the service.

Mr. Foulston: One of the purposes we were told that the rate was to be raised for was to prevent the use of that gas in furnaces. Now, I understand from your discussion this morning, that you rather favor the idea of the use of gas for furnace consumption?

Mr. Doherty: I favor the idea, but you are surely taking a little different position from what we are taking. If we can get a situation that enables us to go ahead and carry this property along as a going property, we want to develop all the reasonable business we can in it. If we can't do that, we want to conserve our gas and yet a high enough price to try and salvage our property without loss.

Mr. Foulston: This new scheme is to seek the object which you have stated?

Mr. Doherty: To make it unnecessary to salvage the property.

Commissioner Green: If there are no further questions, Mr. Doherty may be excused.

It is awfully unpleasant to wake up and find some one has made a sucker of you, but I would sooner be a sucker one hundred times than to misjudge any one who wants to be my friend.

—HENRY L. DOHERTY.



HENRY L. DOHERTY

1920

1920

The biggest year in the history of the oil business was 1920, and the prosperity of the industry was shared in by the Doherty Organization. Not only was the company one of the largest public utility operators in the country but it had become the largest independent oil producer in the country. In spite of the prosperity everywhere in evidence, level heads were preparing for the inevitable period of depression to follow. The boom collapsed toward the end of 1920, but the Doherty Organization, with its policy of preparedness, withstood the storm better than most of the others. Mr. Doherty has always insisted on a conservative dividend policy, with the result that his companies have been able to meet dividend requirements continuously once a definite program has been established. True, when the war began, all dividend payments were temporarily suspended, but it is also true that all back dividends were subsequently paid. It was probably this conservative policy which protected the Doherty companies more than anything else in the trying days of readjustment following the after-war boom.

Mr. Doherty's fiftieth birthday — May 15, 1920 — was celebrated by members of the Doherty organization in hundreds of towns and cities all over the world. Each chapter of the Doherty Men's Fraternity planted with suitable ceremonies a tree in honor of Mr. Doherty, and a large number of cables and telegrams, felicitating him on his anniversary, were received. At one of the celebrations Hon. M. F. Stevens said, in part:



UCH inspiration can be gathered from the life of this man. From humble beginnings to great achievement, that is the story in a few words. From a poor boy to the dominating genius of a growing institution which employs twenty thousand people whose properties serve two hundred communities, embracing a population of more than two and one-quarter millions, through eighty-four public utilities in twenty-

one states of the United States and the Dominion of Canada. All this has been accomplished in practically fifteen years. Indeed, that is a great achievement, but it is not all; he has had time to become expert as an engineer. The American Gas Light Association, some time ago, awarded him a gold medal in recognition of his extraordinary service to the Industry. Nor is that all; he has had time for thinking, for meditation; that which most men scoff at, he has made great use of. It has made him a "Public Utility Philosopher."

Many a serious business controversy could be avoided if both sides would pause to find what are actual facts.

—HENRY L. DOHERTY.

Mr. Doherty was frequently asked to contribute articles to magazines and newspapers, but lack of time has made it difficult for him to accede to many of these requests. In 1920 he wrote an article on "Some of the 'Whys' of Success and Failure," in which he said:



NOT long ago I heard a young man complaining because he had to do office work in the evening. He was walking along the street with a friend, and as I passed I heard him say:

"I'm supposed to work only eight hours a day, and that's all I'm going to work."

I did not hear the rest of the conversation, but what that young man had said about "working eight hours a day" helped to prove my theory that the increasing tendency toward shorter hours is one of the reasons why the young man of today has an exceptional opportunity to achieve success. When most people are willing to work only eight hours a day, the opportunity of the young man who has no aversion to work must be apparent. With everybody else working but seven or eight hours, he has less competition than ever before in the world's history.

I do not mean to decry the short working day. An eight-hour day may be more efficient than a ten-hour day; but I do think we should give a little thought to the sixteen remaining

hours. If a man yearns to have two working hours less each day in order to have more time for outdoor recreation, for educating and bringing up his children, for profitable reading, or for anything else that makes for the improvement of himself and his family, all well and good; but if he desires shorter hours for the sole purpose of having more time for mere idleness, then I say that at heart he is just a plain loafer. So when a man asks his employers for shorter hours, let him also ask himself what he would do with the extra time if he should get it.

One trouble is that the average man does not know what is a full day's work. What seems a full day's work to the employee may not seem so to the employer. But if the employee is honest with himself he will do such a good day's work that it cannot help but be noticed. Hard work does not always bring advancement, but when an employer is looking for a man to push ahead he does not choose the poorest workman, or the average workman, but the best.

Too many men neglect to study their own line of work because they are more interested in something else—something that gives them neither financial nor intellectual profit. For example, baseball is a grand sport and I am fond of it; but if I am hiring a salesman I would rather have him know the goods he is employed to sell than be an authority on batting averages. By working hard at the lodge a man may become an Esteemed Inner Guard, but the same amount of effort might make him a more efficient workman, and place a few hundred extra dollars in his pay envelope. I had an employee once who, though intelligent and studious, never advanced much. His trouble was theatres—not so much seeing plays as devoting all his spare time to becoming an authority on theatrical matters. He could tell you offhand about every play in which any prominent star had appeared, and he spent my time upholding his statement. But you see, he was not in the theatrical producing business, and had no way of marketing all his information.

It is extremely unwise, I repeat, to spend too much time playing some other fellow's game. When two men are running for mayor, for example, it is a duty to vote for the best man, and to get your friends to do so, but it is foolish to throw away too much time and energy in heated arguments, pro and con, that convince nobody. I remember a barber who paid little

attention to his customers because of his interest in the candidacy of a certain politician. He had studied that politician's arguments so thoroughly, and spent so much time in "boosting" him to customers who came into the barber shop, that he had no time in which to make himself a competent workman.

It frequently happens that a man is discouraged over his future because he knows he has only a fair education and but a modest amount of ability. To such men I say that wisdom is not a matter of elaborate education. Being wise, in my opinion, is more a matter of temperament than of initial quantity or quality of brains. Some of the most studious men never achieve any results, because they lack ability to apply their knowledge. It is often more advantageous to learn how to apply some commonplace information in our possession than to learn a new set of facts which we are unable to make use of. This knack of utilizing commonplace facts is one of the greatest assets a business man can acquire. On the other hand, one of the greatest shortcomings of many so-called educated people is their idea that their education is complete, and that they needn't keep on learning.

The worst thing of all is for a man to be both mentally lazy and conceited. If mentally lazy he will not think any more than he has to, and if conceited he would rather have a wrong opinion go unchallenged than be corrected. Many a serious business controversy could be avoided if both sides would pause to find what are actual facts. Differences of opinion are irreconcilable usually, not because one side is wrong and the other right, but because both sides are wrong.

I have known a number of brilliant men who failed because they were unable to shake off their belief that a small element of dishonesty in business was really shrewdness. They agree that honesty is the best policy, considered in a general way, but think there is no harm in being dishonest in some minor business details. The fact is there ought to be more scrupulous honesty in big business than in any other human relations. For big business requires team work on a gigantic scale. Crooks have to work in squads of one. Or, at any rate, in such small squads that they can always watch each other. No matter how dishonest a business man may be, he wouldn't want a dishonest cashier, a dishonest clerk, or a dishonest secretary.

It is well to remember, too, that in business every heat is not a race. Many a man has made a needless failure because for purposes of immediate gain he let himself lose the reputation of dealing fairly and generously with others. There are some men who believe in playing the short game. There are others who believe in playing a long game, in doing the right thing now, so as to build up for the future, instead of doing the wrong thing and profiting by it at once.

BE SATISFIED

Strive not to be a dissatisfied employee. If you are one, there is something wrong with the boss, or with the concern you work for, or with yourself. If the trouble is with the concern or the boss, the sooner you leave them the better; if the trouble is with yourself the sooner you find it out the better.

If you are called upon to take an executive position with a badly demoralized organization, and quick action is necessary, discharge every dissatisfied employee, and you will get rid of seventy-five per cent of the incompetents, and ninety per cent of the trouble makers. Not every employee who is dissatisfied is necessarily an incompetent, but nearly every trouble maker is a dissatisfied employee.

When you see some man whom you regard as "a dub," but who, nevertheless, has made a business success—and there are many such—it is a good thing to study where he has certain characteristics which you lack. First of all, you may find that he is a kind of good-natured fool whom people like; he has the faculty of making friends and keeping them. If he is conceited, his conceit does not take the form of trying to drag down other men so that he can appear big in comparison. Very often the reason why a man fails to get a promotion is that his fellow employees would resent having him put over them; they would resent it probably for a very good cause, and the boss knows it.

If you are fortunate enough to reach an executive position, keep it in mind that a great executive is a person who never does anything that he can have done by anybody else, but who, nevertheless, always keeps busy, not necessarily with hands and feet, but with his thoughts.

KEEP YOUR TEMPER

Never lose your temper. Many men have an idea that display of temper is a sign of strength, of the power to direct other

men. The truth is, of course, that temper comes from lack of self-control, and is, therefore, an indication of weakness. Moreover, it causes some disarrangement of the nerves of blood system, which, not being a medical man, I cannot explain. I simply know from my own experience and observation that ninety-nine times out of a hundred it lessens a man's mental ability, and usually makes a fool of him.

ALWAYS BE COURTEOUS

Be courteous to the people you deal with, but see to it that courtesy with you is not a mere matter of form. The object of courtesy is to make better friends of the people with whom you come in contact. If you will adopt the plan of making a better friend of everybody you deal with, you won't have to think anything about whether you are courteous or not. Your heart will tell you what to do. If your heart does not seem to function properly in this connection, just remember that business courtesy is nothing more than a practical application of the Golden Rule.

LOST MOTION IN BUSINESS

We sometimes make the mistake of over-estimating a man because he seems to be always busy, always in a rush. They are as full of lost motion as a cricket on a hot stove. And yet their mere physical activity is apt to deceive us. And this holds true also of men who are showy in some other way.

I was conducting a big public service plant in a Western city at one time and trying out many new methods. Industrial managers of one kind or another from other places often came to the plant, and it frequently happened that one of them would take a fancy to one of our men and hire him away from us. To do so, under the circumstances, was a breach of business courtesy, and we were often not a little vexed about such episodes; but here came the joke of the situation: the men whom the visitors had lured from us were almost invariably those whom we had been tempted to discharge anyhow. It was never the quiet, serious workers that attracted the visiting employers, but rather some talkative chap whose abilities were largely concentrated along conversational lines.

A young man told me, a while ago, that he was greatly discouraged by the fact that one starting out without capital or influence has little chance. He was convinced that the rich are

getting richer and the poor poorer. If he had but looked about him he could have seen how untrue was his idea. The bulk of rich men today are the sons of poor parents. The sons of the rich of a generation ago are in many cases poor and forgotten. Even the fortunes which were so huge as to be incapable of dissipation in a single generation are of no particular importance in the financial or commercial world. The man who possesses wealth alone plays little part in shaping our financial or industrial destinies. The man who can command money is the important factor.

It is true that more and more persons in America, during the past generation, have acquired incomes above the average, but as a rule either they or their parents were poor. Moreover, there is in this country more show of wealth than actual wealth, because the tendency is toward extravagance and lack of thrift. People spend an immense amount in various foolish ways, simply because it is customary for persons of wealth to do so. When a man acquires a fortune he feels it almost a sacred duty to build a big dwelling house, the fact that his family may be small, so that a five-room bungalow would represent in his case the acme of housekeeping comfort, makes no difference. He must have a big house as a sort of monument to his ability to have such a house.

BE THRIFTY

No matter whether your income is three thousand a year or three hundred thousand a year, it is well to stop and consider whether you are buying things because you need them, or even really want them, or simply because you think the neighbors will think you ought to have them.

About three years ago a friend was telling me about the trouble he had trying to make ends meet on six thousand dollars a year. I said he should be able to live happily on far less than that. Then he went on to point out the cost of various things, and finished by saying: "And, of course, a fellow has got to keep an automobile."

"I haven't any," I told him.

"Oh, maybe not," he replied, "but then everybody knows you could have one if you wanted it. So you don't have to own one."

Without realizing it he had hit on the crux of the situation. He, like many others whose extravagance is a big obstacle in the

path toward success, was trying to maintain as high a position as possible in what he understood to be the social requirements, instead of living quietly and moderately in the attempt to save a little money so that if the time ever came when he had a chance to go into business for himself he would have at least a small capital with which to work. I have watched this matter closely, and I know it is the men who live within their means that are successful.

So many men have started "scratch" as you might say, that is, without any pull or capital or special favor of any kind, and have succeeded, that there is no reason why others cannot do the same thing. The man who isn't succeeding in this age might as well make up his mind that it isn't because of lack of opportunity, but because of some lack of himself. And if he is wise he will lose no time in determining just what this lack is.

Intelligent and discriminating buying would, to a great extent, make profiteering impossible.

—HENRY L. DOHERTY.

In 1920 the final settlement of the Toledo traction problem was reached. While in Toledo during these negotiations, Mr. Doherty was asked to make a statement in connection with an interview by Henry Ford, in which Mr. Ford stated that the automobile would put the trolley out of business. Mr. Doherty said:



PROBABLY most of the people in Toledo think of me only as a public utility operator, and as the street railway company has been mostly in the limelight since I became associated with your public utilities, it is only natural that these people should think of me exclusively as a street railway man. The real truth of the matter is that our business from the standpoint of size and importance is that of producers, refiners and marketers of crude oil and its products. During 1917 and 1918 our Government, due to the stress of war conditions, urged all of the oil companies to produce as much oil as they possibly could. Our companies produced over fifteen million barrels of refinable oil in 1917 and more than eighteen million barrels in 1918. The 1918 figures, I believe, are record

production for any single company for any year of refinable oil. At the present market price for crude oil in the field, this would be \$54,000,000.

"If a large portion of the street cars in the United States were to change over to the use of gasoline as a fuel for motive power instead of electricity, we would make far more out of our oil business than we would lose on our street railway business. However, I do not want to fool myself and want to keep other people from fooling themselves as to what can be done along this line.

"I heartily welcome the almost universal attempt that is being made by the automobile people to break into the street car problem of transportation. I think it will result in benefit to the street railway properties and to the riders.

"Every business is apt to get into a rut and the man with the outside viewpoint often accomplishes some splendid things, even though ninety five per cent of these first new ideas are worthless.

"The first idea of the automobile engineers was to do away with the tracks and for what they called a trackless trolley. A number of these systems were put in, especially in Europe. They have naturally been a failure. Today all of the advanced automobile people are convinced that they must use steel tracks as rubber tires present many handicaps in addition to excessive costs over and above the steel wheel on the steel rail, so the automobile people have now swung around to the idea of reinstating the tracks but now have an idea of abandoning the trolley. This, if anything, is more absurd than the abandonment of the tracks.

"First, regardless of technical efficiencies, by long odds the cost of power is far less at this time with steam turbines than with internal combustion engines, and even the stationary internal combustion engines that can use cheap fuel oil for power are unable to compete with the steam turbine using coal.

"The oil companies naturally try to encourage the use of oil for all purposes and, yet, practically none of the tankers now being built are being equipped with oil burning engines, but instead are being equipped with steam apparatus using oil for fuel under the boilers. One of our tankers is equipped with oil burning engines and we will gladly trade this tanker for a steam

driven ship. The sister ship of this tanker is owned by one of the very large oil companies and is now undergoing remodeling to displace the oil burning engines for equipment generating power by steam.

"The internal combustion engine instead of making progress in stationary power practice and on board ship is relatively going backwards. The internal combustion engine can only secure a high efficiency when operated to maximum load and to put an engine on every car, which must have sufficient power for the heaviest pull on the heaviest grade and with snow upon the tracks, operates at a shockingly low efficiency when operated at a small percentage of its rated power pulling a car on a level grade. Not only this, but the aggregate sum total of power required for all cars when each is equipped with its own prime mover would prove to be eight or ten times as much as the aggregate power which must be installed at the central power plant, because it is obvious that all cars do not require maximum power at the same time.

"It is also rather amusing to me to see the rather rash predictions by some of the automobile engineers while at the same time the men interested in the financial side of the business are pretty anxiously inquiring of men in the petroleum business what the future holds for them in the way of a gasoline supply at any price.

"It is the common prediction of the government scientists that the mineral oil supply will be entirely exhausted in a quarter of a century and, if this is true, people who were talking about a street railway property becoming obsolete had better figure the effect of exhaustion of oil on the gasoline car. However, I take no such pessimistic view of the oil supply of the country, and as Chairman of the Motor Fuel Committee for the American Petroleum Institute, I have been able to honestly tell the automobile interests that the exhaustion of our oil supplies is a long ways off, although it may be that the price of gasoline will at times have to be excessive and I fear that we are entering into such a period at this time.

"The newer oil fields such as North and Central Texas, while a great success in themselves, are far below expectations, and the boast of the vastness of the Mexican oil fields becomes less emphatic month by month. The great Mid-Continent oil fields of Kansas, Oklahoma, and Texas are still enormous oil producers

and, yet, we have seen an advance of Mid-Continent crude oil of 75 cents in the last sixty days simply because production must be stimulated to keep pace with demands, and, in my opinion, advances will have to be continued until this price becomes at least \$3.50 per barrel.

"It is easy for people to fool themselves on the competition between street cars and gasoline buses. If the street car simply hauled passengers when the cars could be filled and for short distances, it could do this at a remarkably low cost, but the great expense of the street railway company is that of being compelled to give service whether any one wants to ride or not, and giving the service means a car going over each line each six, eight or ten minutes, depending upon the schedule for that particular line for that particular day and for that particular hour. Gas buses, as a rule, have never given service at all. They run only at the hours when lots of people want to ride and, as a rule, carry only short haul passengers. If compelled to maintain service as a street railway does and carry passengers for the maximum distance, the charges would become prohibitive and the congestion of the streets unbearable.

"The congestion of streets of many of our American cities is already becoming alarming, and it is to the street railway company that the cities must eventually turn for relief. One car running on steel tracks and carrying the capacity of many wagons is less objectionable than that number of wagons, and the street railway companies can, if necessary, handle much of the city freight and package traffic at night when the tracks are not in use and there is little other traffic to interfere with its movement.

"One car carrying 25 to 100 people will naturally cause less congestion than will 12 to 50 privately owned automobiles carrying from one to four people and averaging, we will say, two people to the car.

"The price of gasoline is now 20 cents even at the Mid-Continental refineries. Twenty cents means practically a cost of \$1.50 a million B. t. u., while coal at even \$5.00 a ton means a cost of less than 20 cents per million B. t. u.

"The cost of power has proved less by use of coal and steam turbines in the large stationary plant as against internal combustion engines even with oil for fuel at five cents per gallon.

To assume that this great difference in the cost of fuel can be made up by improvements in the internal combustion engine is an idle dream. The automobile manufacturers fool themselves with their own figures because they assume a dead weight per passenger of only a fraction of the dead weight which is now represented by steam and street railway equipment. If they would figure the same weight of cars as now used in steam or street railway equipment, their costs would be prohibitive.

"It is in the building of a lighter car wherein the automobile man is going to contribute wonderfully to the success of the street railway company and to the benefit of the car rider. The use of a light car is possible and will bring great economy of operation. Prior to the outbreak of the European War our engineers had become convinced that it was impossible to get the builders of street cars to build an ideal light street car and had taken the matter up with some of the automobile manufacturers who were at that time designing cars for us, but were compelled to drop this work because of the problems presented by the war.

"In the interest of conservation and for the public economy in years to come we should substitute, as far as possible, hydro-electric power in place of electric generating by the burning of coal. However, our coal supplies are practically inexhaustible. There are vast deposits of coal that are never now figured in our coal supplies simply because they are not economically valuable, being either in remote locations or in very thin seams. Missouri alone has thousands of acres of coal veins in thin seams that are a little too deep for strip mining and yet too shallow and lacking proper roof for shaft mining. However, immense quantities of this coal would become economically valuable before we had reached the higher cost for oil; therefore, as far as possible, coal should be used wherever it can be instead of oil and thus make no unnecessary draft on our oil supplies, as it is already becoming a problem how we are to meet the rapidly increasing demands for oil for automobile use and for many important industrial uses where oil is a far superior fuel to coal.

"All of our oil products are in a way by-products to each other. This is interesting to note that the oil business sprang into being primarily for the use of lamp oil and, yet, the time came when kerosene became a drug on the market and immense quantities were simply mixed and burned in furnaces.

"The low price of kerosene has caused the gasoline motor manufacturers to substitute kerosene for gasoline, and the price for kerosene has therefore gone up to the price of gasoline and, therefore, little additional kerosene would have to be used for this purpose to put the price for kerosene the same as gasoline. However, gasoline is more easily used and is generally considered a more desirable fuel and, in my opinion, the public will always be willing to pay at least 20 per cent more for gasoline than for kerosene. I expect, therefore, that the future price of kerosene to prevail at about 80 per cent of the price of gasoline.

"In my opinion, the substitution of gasoline for electricity on any large percentage of the street cars of the United States would drive the price of gasoline as high as 40, 50 or 60 cents.

"In spite of the crisis which now confronts the street railway business. I am extremely optimistic of what the future holds for it. No matter how coal prices may advance, labor prices, and things of that sort, the street railway is bound to continue to be the cheapest means of city transportation. When the novelty has thoroughly worn off people will be less inclined to ride in automobiles and more inclined to ride in street cars. Eighty per cent of the people using automobiles are fooling themselves of what the real cost of operation is.

"As our cities grow and the streets become more congested, the automobile will become less and less attractive as a contrast with the street cars. In some cities they give the street cars the absolute right of way on the theory that a conveyance carrying 50 people is entitled to greater consideration than a vehicle carrying one or two people.

"The whole difficulty with the street railway problem at this time is the one of fixed fares either by law, franchise, or public opinion, and this could be straightened out if the public could be made to see the fairness of increasing fares. We have seen the price of almost everything double and perhaps treble. The street railways have had to increase their expenses enormously without a corresponding increase in fares.

"People think only in terms of coins. I have often felt that a ten-cent fare would have proved less objectionable than a 6, 7 or 8 cent fare, simply because it represents even money.

"We have gone through a period when we have heard nothing but low fares and, yet, what the public will demand sooner

or later is, primarily, good service and more frequent service. Only a slight addition to the fare is necessary from what it costs to give minimum service to give a much more liberal and a much more better service. The working man insists that his time is worth 50 cents an hour, and, yet, he will insist upon such a low street railway fare that he most generally loses 3 to 5 cents worth of his time by saving something less than a penny in car fare."

In giving a complicated line of testimony it will be much easier to remember what you want to say if you will confine yourself to the exact truth.

—HENRY L. DOHERTY.

In 1920 the executives of the Doherty Organization met in New York for a general conference on business development. Mr. Doherty spoke twice only, but he covered a good deal of ground—investments, taxation, training schools, thrift, and labor. He said:



WROTE out a statement last night showing some of the things that have caused the present financial situation, that have brought about the diminution in the value of securities. First, I told about the enormous number of securities that have to be sold abroad—American securities that had to be sold from abroad here; and I am going to get that put in a table and show how their currency has depreciated over there, and what each security will sell for, in dollars or francs or marks, or whatever it may be. The putting of that enormous amount of stuff on our market has depreciated it every year. And then I take the type of man who is taxed by the government for practically all he earns—71 per cent of it goes to the government and 29 per cent to him. So that if he had an old corporate bond, drawing 5 per cent, the government takes 71 per cent away and leaves him with 1.45 per cent earning power. He must earn on a corporate security enough more to make up the income which he would get on a tax exempt security, and if you figure 6 per cent on a tax exempt security, he has to earn 21 per cent on a corporate security.

While I am on the tax law—it is a good thing to talk about, because we all want to see these heavy surtaxes come down—our present income tax has greatly discouraged the buying of corporate securities. It has almost put the kibosh on it. The man with an income tax to pay feels that he must buy a tax exempt security, or else he must buy a non-income security, or else he must buy non-productive property. So, before we relieve the situation that now exists, and relieve the difficulty of raising a proper amount of money for the regular expansion of our country and business, we have got to reach the man who has not been heretofore a security holder. It used to be that the wage earner could save very little to invest in securities, and he thought perhaps it was not worth while monkeying with them. Today that is not true, when you think of the enormous wages these men get. And take the little shopkeepers around the town, who have enough money to invest in these securities—they have to be induced to do it. We shall have to recruit from those ranks the people who can buy securities. At the present time we are conducting a campaign to see what can be done along those lines. The minds of business men have been running a long time towards getting business conditions in this country back to normal, which can only be done by getting a large number of the people who have not saved their money to begin to save their money; and, secondly, to get these same people to invest their money in corporate securities. It is needless to tell you men what it would mean to the corporations of this country if the majority of voters owned securities in corporations. If I were running the Interborough Rapid Transit Company here, I don't know what I would be willing to pay for 100,000 new stockholders. If I had 100,000 stockholders in the Interborough, I think they would be very valuable to me.

Just a word more on that because it does not apply wholly to the class of people who have not heretofore saved money. The post office authorities tell us that there is taken away from the people of the United States every year in fraud that can be traced, an amount not less than \$250,000,000. You will probably say that is due to the stupidity of the people who go into those schemes. That is not wholly true. It is not because those people are so stupid. Here is one reason that they do go in. They don't get any opportunity to go into anything but a fraudu-

lent scheme. A man cannot afford to go around and talk to these little fellows about a gilt edged security. When we go around to try to sell that man an investment security, we can only promise him a very small rate of return, and no chance for a profit. But just now we can promise him a very high rate of return on a strictly gilt edged security, and a chance for a very large profit. If we can sell him some 5 per cent bonds, priced down to 66 per cent on their value, he is buying them on a basis where they will yield him $7\frac{1}{2}$ per cent, and when things come back to normal, he has made a profit of 50 per cent on the value of his property. We are so apt to become accustomed to the conditions that surround us that we do not contrast them with what has gone before, or what is normal.

I sat with a group of men the other day and I made three or four statements, every one of which was contradicted by men who are more familiar with financial affairs than I am. I claimed that during the '90s, there were two or three years that the discount rates had not gone above 2 per cent. One of the men contradicted me, and he went to his office and he telephoned back to me, and he said: "I have a book which goes back to 1846." I said: "Send that book to me." And I found in it some changes. There would be ten changes in one year. And then there would be five in another year. And I ran my finger to the 2 per cent. I looked to see how long it lasted, and I finally came to one of them, February 22nd, 1894, the Bank of England discount rate went down from $2\frac{1}{2}$ per cent to 2 per cent. Then, 1895 was marked "No change." In 1896, on September 10th, it had gone up to $2\frac{1}{2}$ per cent again. I said, "what the hell are you doing, lying with a book in front of you?" He says, "yes, that is for just a little time." I said, "no, it continued for a whole year."

Now, we have these abnormal periods, such as we have gone through and we have sub-normal periods, and we do not then have to figure as to what a man might do with his securities.

Some one called my attention to a story that I had forgotten, though I had heard it a great many times before. I am going to find out some day whether it is really true. During that period of the middle '90's, the New York Central was offering a \$100,000,000 loan at 3 per cent for 60 years, I think it was,

but it was refused because the rate was too high. At that time New York City bonds sold as low as 2.65 earnings basis: Cincinnati 2.85 earnings basis. I was figuring on a lot of traction company securities on a 4 per cent basis. We forget those times, and some people say those times will never come again, but in my opinion they will come.

I made another statement that was denied also. I was trying to figure out how quickly we could change from conditions such as those we are going through, to a more normal or sub-normal basis. We know how fast we changed from a low rate to a high rate. The question is how long will it take for this country to get back to something like a normal basis. I looked this up once and I state it only from memory. After the close of our Civil War, within five years of the time that our Government bonds were selling on a 10 per cent earnings basis on the purchase price, the government placed a new loan for nearly \$200,000,000 at 4½ per cent for five years. I may be wrong on that—just as I might have been wrong on these other statements. So, if you get a chance to check that up for me, do it.

Now, we have a chance to go out and say to a man: "Buy these securities. We don't say they are going up tomorrow or next week. In fact, you are all the better off, the longer they stay down, because the more money you can save to get into them, the better off you are. You are sure of getting a splendid return, and you are going to get a very handsome increase in the market value." You want to prepare some details to show what it means to compound money such as we are doing now—at 8 or 9 or 10 per cent, and so forth, for a period of years.

I worked up a little example last night. I wish I had brought it along. We will say a man goes to work now and he says: "I will deprive myself of a suit of clothes for the sake of buying securities." His suit of clothes will cost 50 per cent more than in normal times. He goes without the clothes. He buys securities at 66⅔ per cent of their value and he saves on his clothes. So he has got twice as much money in the way of securities now that he is going without a suit of clothes, as he would in normal times. He has got twice as much par value of securities. In addition to that he has got something else. Let us assume a waterpower plant costs \$1,000,000 to build. Let us

assume it is bonded at \$500,000. Now that bond has gone down, we will say, just because it has a low interest rate, and has gone down to 70 per cent of its face value. The reproduction price of the property has gone up from \$1,000,000 to \$2,000,000, and therefore the entire bond issue represents 25 per cent of the reproduction value of that property, and if he has bought that bond at 70 per cent of its face value, he has really bought it at 17½ per cent of its actual value.

You have got all these arguments to give to your customers whether they are security buyers or not—why they should squeeze and do everything they can do, to buy securities at this time, and get out of the real estate market, if they can, and get into the class of security that will enhance in value.

* * * * *

When you talk of socialism that means anything in the world, and socialism, as it is considered now, is a very different thing from what socialism used to be; it has as little semblance of what socialism used to be as anything could have. The one fundamental thing that socialists have got together on is that all means of production and distribution should be held in common and given to everybody, with no individual group ownership or anything of that sort.

There is sometimes a tendency for some fellow to come along and get up a separate electric plant. We do not like that, it hurts our business, and yet we are doing more or less the same thing when we get over into the retail men's business or the doctor's business or anything else. I am not prepared to say how far we should go into these things or how far we should not—I am only suggesting that you should just keep in mind carefully what you are doing. As to the matter of the schools and training, the older I get the more timid and reticent I sometimes feel, and yet whenever we start to talk about schools and training I always swell up a little bit and assume an attitude of more or less importance. I was out in Toledo not long ago; they were telling about the school work and how it started the work of Bump and Griswold and some others. I got up and said: "Don't forget, fellows, I was the first school teacher. I was the fellow who turned out all those stars." I cited some of my stars, Bump, Griswold and Scott—all the older men at that time had become stars.

Before the training school work started in the early days I had ambitious ideas of the number of men we ought to employ,

but some of the others in the company did not have as large ideas about that as I had. You men all see the importance of this work now, and I agree that it should be extended.

Speaking a little bit regarding Mr. Allinson's recommendation and the letter from one of the cadet engineers which he read, our theory originally in this school work was this: That we would take these boys in from the universities and teach them the whole of the gas business—that is, we would give them an opportunity to observe and get a greater or less knowledge of the whole of the gas business and the electric business—at that time we had only gas and electric — and when they left their school work, presumably they would specialize, more or less. Whatever they were doing they would try to make themselves experts.

We had another plan, too, that we have since dropped so I will not go into it, but I am one of those who believe that we generalize too much in our education. The average man whom we call an educated man has his education spread so he does not know anything well enough to make him a useful citizen. He can be made part of a cog in an organization or something like that, but the average fellow with the usual education does not know enough about any one thing to be well in the running. I cannot see the idea, for instance, of teaching an engineer a foreign language. It seems to me it is a plain waste of time. I have said before, you men perhaps have heard it, that I would not have traded my knowledge of cookery for the knowledge of a foreign language—the former has been more useful to me in my work.

I do not think I need urge on the organization now, the great benefit of the training system, and how we ought to extend and improve it at every opportunity. I think I can, however, start on one of my old complaints, even though I believe this organization is 100 per cent ahead of any other group of men, and that is the thought I have so often expressed—I never in my life could see the theory of why we should devote all of our lives in early years to schooling and education and devote none of the later years of our lives to schooling and education. I think we are 100 per cent ahead of any other organization I know of, in that our men do study after they have ceased to be pupils in universities, or pupils in technical schools, and we have reached a point of almost 2 per cent efficiency in that respect. We are 100 per

cent ahead of the other fellows and we have reached an efficiency of 2 per cent with regard to our studies after graduating from school. The tendency is to quit studying after you finish school. I am fifty years of age and I have been a student all my life. If I live to be seventy or eighty years of age I expect still to be a student. I had the good fortune of being compelled to educate myself. I think it was really good fortune that I was compelled to educate myself, because then I did not know when to stop; whereas, in the case of the average boy who goes to college he stops studying the day when his diploma is handed to him.

I know only a few men who have been serious students after they left their universities. There are a few who study now; to find a consistent, earnest student is very unusual.

Now I heard one matter brought up here today that I thought was a dead letter in our organization, if it is not I am going to get back into the harness and exert myself. That is the suggestion that the cadet engineer is given advantages over the other man. From the very first, the plan of the organization has been one purely of the recognition of merit. We will take these men and train them. After they have been trained, then they are strictly on their own bottoms, in competition with every other man in the organization. Mr. Chairman, where we err, if we err at all, it is not as a matter of favoritism. But where we are in doubt we always pick the self educated man, the man who has worked up in the ranks. Do not let there be any idea whatever that these men are treated with any special favoritism.

I intended to touch on the matter of thrift, but I cannot, because there is another subject that I feel, after listening to Mr. Kennedy's remarks, we should consider, although of a more or less general matter and one we are not so specifically interested in. It is not particularly a Doherty problem. I refer to the labor situation throughout the country. I was talking the other day to Herbert Straight and Pat Miskell, and I said: "It is fifteen years since I started in business, and there has been a succession of turmoil about something ever since. If it is not a European war it is a panic, and if it is not that it is something else. I would like to see a little bit of peace, and the thing I wish most is industrial peace."

Mr. Kennedy referred to a matter I know is universally true. He said, in a way, that every employer is thirsting for

revenge on his men. I am not surprised at that because if this country has ever been subjected to tyranny, it has been subjected to tyranny by organized labor. They told the President, Congress and everybody where they got off, and there is one message I want you to take home to your friends, the employers and everybody else: For heaven's sake do not let the employers of this country get into the attitude of being revengeful. It would be the biggest mistake in the world. You know, only a few years ago, organized labor could do anything it wanted to do; public sentiment was with them. Today they have not public sentiment with them.

To hold sentiment where it is, is a difficult matter. The public does not analyze these things and does not see them in their true bearings. The public blames the employers; and if we have bread lines for a while, and things of that sort, sympathy will return to the laboring men, regardless of anything the employers do; if the employers are short sighted enough to be revengeful, they will re-establish labor where it was. I do not know what the answer will be; I never felt it was up to me, but sometimes I think, perhaps everybody feels the same way, and, as the thing stands now, we hardly can have both industrial peace and good conditions for wage earners.

We know what labor wants—it wants all it can get, whether it is fair or not. When you have a condition when the laboring men are entirely employed, that alone will start a growing wave of unrest. Every strike brings a further shortage of labor, and with such an attitude, the only way we can be sure of peace is to have such a surplus of labor that a lot of men are in the awful position of having no employment whatever.

Labor is to blame for that. The employer must not get himself in the eyes of the public where he has once been, and say he is going to hire his labor as cheaply as he can, regardless of how cheap that is, because we know the position of labor is that they will get all they can, regardless of the merit of their demands. The employer cannot afford to take so short sighted a position.

There is one thing about the labor situation which alarms me more than anything else has at any time in its troubled history, and I refer now to the matter of sabotage, loafing and shirking, which is due to the propaganda, which has been in-

stilled in the minds of these workers that the less work they do, the less production they turn out, the better the laboring man is off.

Many of us have seen a larger part of the industrial development of the German Empire. All of us have read of the enormous development of the German Empire industrially over a period, we will say, of fifty years; and I attribute that development not so much to anything that happened in Germany, but to something that happened in England. If you will go back to the period of about our Civil War, you will find a term used there—I wonder it was ever dropped, because to me it is so expressive—the “lump of labor.” It was meant to express that there was just so much labor to be done, and the less every man did, the more employment there would be. The result was that the laboring classes of England resisted the adoption of labor-saving machinery, limited the production of every workman. Britain ceased to be the country that dominated the manufacturing interests of the world and changed to a country where unemployment was becoming a danger to the Empire, and that, in spite of the fact that they had practically the lowest wage scale among the large countries of the world.

I remember on several occasions how I would get an itch to do some certain kind of work in England, on account of the short distances there. In thinking of the work we have done in this country in carrying natural gas over long distance through pipe lines, and in the case of our electric service over long systems of overhead transmission lines, I got an itch to do something in England. I was staggered at the enormous cost of production. I wanted to carry out the manufacture of gas at the coal mines, and convey the gas to the cities in pipes, and the first thing that struck me was the awful cost, per ton of coal, at the pit mouth, compared with the wage scale. Because of that low wage scale, England was enabled to compete with other countries, Germany and America particularly, and so it alarms me to see this theory gaining ground in the United States. I feel there are many things we should start in to correct in our labor program, and not do as many employers are doing now, make one straight drive, regardless of everything else, in the reduction of wages. The first thing they should do is to take steps to improve production, to secure a greater output.

If I were going to bring about a reduction of wages in some of the plants, the first thing I would do would be to get rid of a lot of men instrumental in making friction in the force, and then take up the problems of production, and, last of all, I would make a drive at the wages, that is, where it is possible to do that. In other words it makes no difference to us, it makes no difference to the laboring man, whether the wage scale is high or low, if wages are uniform and relatively right; it would not make any material difference, if we were doing strictly an internal business, whether wages were high or low. But if you are considering foreign business, there it means if the wage scale is too high, you are simply unable to open up the ports of other countries, and you are leaving your ports subject to the commercial attacks from other countries.

Outside of that it makes no difference—the workmen are working for themselves. Who wears out the shoes? Certainly not simply the men of wealth—in fact, they wear out very few. The workmen are working for the working people, and the wage scale makes no difference.

Our national virtue is a sense of humor and our national folly is lack of thrift.

—HENRY L. DOHERTY.

In preparation for a paper to be delivered at a gas managers' meeting in 1920, Mr. Doherty dictated the following memorandum:



AS originally was manufactured solely as an illuminant. Murdoch, an Englishman, discovered that coal baked in a closed vessel externally heated produced a mixture of gases yielding in comparison with other means then available a desirable illumination when burned in an open flame. Practically all gas for town distribution was made in this manner for nearly three quarters of a century. To insure satisfactory service to the consumers public authorities prescribed standards of quality for gas based upon the gas made by Murdoch's methods.

The discovery of mineral oil subjected the gas companies to the competition of cheap and highly efficient lamp oil, and also gave them a new raw material for the manufacture of gas. Oil retorted in the same manner yielded a gas much more powerful as an illuminant and of much greater heating energy per cubic foot. This gas, however, did not prove commercially satisfactory.

However, the Lowe process, whereby a non-luminous water gas was made and enriched with oil, proved to be equally satisfactory as compared to coal gas and permitted gas to be made of a higher candle power which was still more satisfactory when used exclusively for illuminating purposes in open flame burners.

The introduction of carbureted water gas, namely non-luminous blue gas enriched with oil, caused in some cases a slight revision of standards naming a still higher candle power than could be secured with coal gas.

In spite of the fact that conditions have entirely changed we are still working under the same standards created at a time when gas was used exclusively for illuminating purposes and entirely in open burners. Today in some cities not more than 20 per cent of the gas is used for illuminating purposes and 95 per cent of the gas so used is used in mantle lamps, leaving only 1 per cent of the total gas that must be enriched to comply with the need for which it is used.

The gas used in open tips for illuminating purposes is due entirely to shiftlessness, for by the use of mantle lamps the illumination would be increased seven times and the customer would be actually benefited by being supplied with a non-luminous gas and thus be forced to use mantle lamps.

2. RAW MATERIALS.

At the time the standards under which we now work were created there was an abundance of high grade coal to be had at prices practically the same as the prices prevailing for what we now consider as inferior grade coals. Many gas companies throughout the country cannot meet the standards created many decades ago except by buying high grade coal, commanding a premium price at the mines and frequently requiring shipments for long distance and at great expense.

In the early days of the oil business many of the products were almost unsalable, and any of these unsalable products could be used for the enrichment of gas. Frequently gas companies

bought oil products for the enrichment of gas at far less than the cost of crude oil. Today there are no waste products in the oil business, and what has been known as "gas oil" for years is now the product from which the refiners produce synthetic gasoline. With the growing scarcity of oil we must expect a higher price for all petroleum products, and in addition to this, on account of new use for gas oil, we must expect a specific additional increase in the price of gas oil.

3. STANDARDS.

If we continue to work under our present obsolete and unnecessary standards it is not so much a question of how we are going to have a cheaper supply of gas but the real question is how we are going to prevent continual increase in the price of gas.

The customer is no longer interested in the matter of candle power. The same thing that gives luminosity to the open flame is the thing which blackens the kettles and brings many of the troubles which lower the efficiency of the gas in practical use.

The consumer is not interested either in what the B. t. u.'s are per cubic foot. Marsh gas, which is the principal constituent of natural gas, has about 1,000 B.t.u.'s per cubic foot and yet is practically non-luminous when burned in an ordinary open tip and will not yield as efficient service per B.t.u. as, for instance, an unenriched water gas which has only 300 B.t.u.'s per cubic foot.

4. GAS MANUFACTURING PLANTS

The manufacture of carbureted water gas required a heavy investment as against plants making unenriched water gas. The water gas machines must have coke or hard coal for fuel, and it is customary for a water gas plant to be equipped with a coking plant sufficient to supply the needs of the water gas machines for coke.

Public regulations regarding the storage of oil in or near cities are such that large stocks of oil cannot be carried, and storage tanks must be of a character and size costing several times as much as the type of tank used for the storage of oil in the fields.

Coal gas plants require a still heavier investment per thousand cubic feet of gas made, and the gas making apparatus must be maintained at a uniform temperature throughout the life of the equipment and must for economical success make gas at a

uniform heat. A single shutdown of a retort plant of by-product coke ovens creates a damage to it equivalent to one year of hard usage.

In making coal gas only about 20 per cent of the energy value of the coal is converted into gas, and therefore five tons of coal must be handled to produce the same energy in the form of gas as would be produced by a single ton if the coal were completely gasified.

5-A. BY-PRODUCT GAS FROM COAL

We have seen from the above that the important thing to secure cheap gas, and in fact to prevent other increases in gas, is to do away with our present standards and adopt rational standards.

It is also important to avail ourselves of the present enormous supplies of by-product gas, namely, gas which is made unavoidably in manufacturing other products. This is important not simply as means of a cheap supply of gas but to enable many gas companies throughout the country, who are now so near the point of bankruptcy that they are unable to finance new generating equipment, to enlarge their plants to meet the demands that are being made upon them.

By-product coke ovens for the manufacture of metallurgical coke are not new but have been used for many decades in Europe. However, their use in this country has only come about on an extensive scale during the last two decades. Prior to that time all coke was made in so-called beehive ovens, where the gas was entirely wasted. The rapid development of the by-product coke oven in America has been brought about, not primarily due to economy, although this is vastly important, but was forced by a scarcity of coal suitable for use in the bee-hive coke ovens.

Many of the by-product plants have been located where the gas must go partially or entirely to waste, and others of them have been installed at points where the gas can only be used for its fuel value and for purposes for which a cheap coal would be just as satisfactory. In some cases these by-products coke ovens have been installed where the gas can be piped into the mains of the gas company supplying the city, but this is not the usual thing.

The great obstacle that prevents the use of this by-product gas for city purposes is the various restrictions on the ability of

the gas company to make a binding contract. All contracts are subject to the approval of the public utility commission, and it is not certain that a contract approved by the public utility commission can be for a longer period than the life of that commission. This has proved a great obstacle in trying to induce the steel companies or the coke ovens making coke for metallurgical purposes to either locate their coke ovens in or near the city where the gas can be used or to build the necessary pipe-lines to carry gas to the cities. They are unwilling to make these investments unless they can contract for gas for a period of years sufficient to enable them to earn, we will say, a sufficient return on a long pipe-line and to amortize the investment over the period of the contract.

There is also the added obstacle that only the richer portion of the gas made by by-product coke ovens can meet the present standards for gas, and therefore half or more of the gas produced in by-product coke ovens must be thrown away or devoted to some inferior use, although just as satisfactory in every way for the supply of city customers. It is customary now to use what is known as the leaner portions of the gas to fire these ovens, but the ovens could be just as well fired, and in some cases are fired, by the use of cheap producer gas having, we will say, 125 B. t. u. per cubic foot.

It should be our effort to have these coke ovens either located in or near cities that can use the gas or to pipe the gas from these coke ovens to the cities and to utilize all the gas that is made and not simply the richer portion of it.

If the steel business was running normally it would probably require half again as much coke as can be made in all of our by-product coke ovens and, in the interest of conservation, all of this metallurgical coke should be made in by-product coke ovens, permitting the saving of the gas, tar and ammonia.

Coal is the great source of raw material for the chemical industry. More products can be produced from coal than perhaps could be printed on a full page of a newspaper. However, to secure these different products necessitates the distillation of coal in many dissimilar ways, and yet our present gas standards virtually compel all coal used for gas making purposes to work under constant conditions and fixed temperatures, producing only such products as can be secured under these conditions.

During the war Germany was cut off from an adequate supply of oil and was compelled to resort to the known processes and what new processes she could develop to secure not only all classes of oil from coal but many of the other chemical products needed. This has laid the foundation for an enormous chemical business of which coal will be the raw product and a certain amount of gas the by-product. England and France also found it necessary to strip from the gas used for town distribution all of the condensable products, including benzol, tuluol and light naphthas. While these are the principal agents which give luminosity and high B. t. u. density to the gas it was found that the service to the customer was not only unimpaired but some believed greatly improved.

While it has been pointed out repeatedly in England that our present standards were highly absurd, producing an economic waste which benefited no one, nevertheless nothing but war necessity was able to force England to the realization of this, but once having realized it legislation resulted permitting the Board of Trade to abrogate all candle power and B.t.u. standards and permit each gas company, with the consent of the Board of Trade, to manufacture that type of gas which is satisfactory to the customer and yet the one the gas company can manufacture to the greatest advantage.

This has given an enormous stimulation to the development of new gas manufacturing processes, and we may reasonably expect to see more development in the next few years than has been made in the last half century, for heretofore there has been no incentive in this line for the man possessed of inventive genius. It is unfortunate, however, that the one country recognized as having the greatest inventive genius is still handicapped by these obsolete standards. Nevertheless, a great deal of work is already in progress towards the creation of chemical plants using coal as their raw product and all having gas as one of their by-products. One of these processes, which I understand is already at work on a commercial scale, is aimed to supply an artificial fuel which will take the place of anthracite coal and which is made from bituminous coal. The large portion of the volatile matter of the bituminous coal is driven off as oil or gas and the plastic mass of coal remaining in the retort is pressed into a briquet of great density, approaching that of anthracite coal.

The plant which uses this process, I understand, is throwing its gas into the air without use. Possibly the ability to sell the gas from these chemical plants will be a great factor in making them a commercial success and will go a long way toward putting America on a parity with the foreign countries in producing raw chemical material from coal.

Large quantities of wood are carbonized in this country to produce charcoal and raw chemical compounds. The gas, however, does not conform to our present absurd standards, although it would make a very satisfactory gas for the use of the consumer. It is not uncommon to see places where huge quantities of waste wood are being burned in incinerators—and perhaps within a stone's throw of where gas is being made of high grade gas coal or oil which has been shipped from long distances away.

There are few classes of business that can submit to public regulation and live. Changed conditions must permit an immediate change of plans. This is not possible when a change in plans can only be made after hearings before a public regulatory body. Perhaps the greatest damage that has been done by public regulation has been the element of delay and the abandonment of any attempt at certain improvements in the belief that simply time and trouble would be wasted and no good would be accomplished. Therefore, it will never be possible for the so-called public utility companies to embark upon any business not absolutely necessary for furnishing the product they are selling to the public. In other words, they could not go into these chemical ventures or things of that sort.

Businesses of this class have huge profits one year and possibly huge losses the next, and they must be undertaken by private corporations, for the whole theory of public regulation has one inherent weakness which few people appreciate, namely, that all profits in excess of a certain amount must be reduced by the fixing of lower prices to the public, and yet the public in no way guarantees these companies against a loss if conditions are such as to cause a loss. It is a case of heads I win, tails you lose. If the regulated company is able to earn a big profit it is immediately taken away from them by the establishment of permanently lowered rates, inviting losses at a subsequent time, and if conditions swing about toward higher costs for the public utility company it must bear these losses alone.

A number of gas companies have already abandoned services; others are in various stages of the abandonment of service. The gas plant at Niagara Falls I think served notice that it would abandon service on February 1st, but the public utility commission has ordered that service shall be maintained until July 1st. Many of the gas companies throughout the country have already been so badly crippled that they could not now raise the necessary money to put in needed additional generating equipment, nor could they put in improved generating equipment, if the standards were changed so as to permit them to do it—and that is another reason why these companies must have the freedom to contract with by-product coke ovens and chemical plants, and this contract must be one of unquestioned integrity which will warrant the investment of a large sum of money.

The bill now before the Legislature permitting gas companies to contract for gas created by plants built primarily to supply other commodities is only one of a number of reforms that must be accomplished, and probably all of them will require more or less legislation.

The next important step will be to empower the commission, with the consent of the municipality, to enter into contracts with the public utility companies whereby a base rate for service is fixed and then for all reductions that can be made to the public the company will be allowed to earn a greater rate of return. This is known as the London Sliding Scale, and Sir George Livesey is generally assumed to be the originator of it. This will prove a great stimulation to bring down the cost of public service.

I have worked all my life to accomplish these and other public reforms which mean so much for the public, and I believe mean much for the companies as well, and at times I have been exceedingly impatient with the opposition and obstacles experienced from the men in the gas business. However, there is a large degree of justification for this dread on their part of any change whatever. Any attempt at change is apt to invite the efforts of the impractical reformer and the publicity seeker, and what was proposed as a change both beneficial to the company and beneficial to the public may become so changed as to be something wholly impractical or ruinous to the company. No amount of scolding, threatening or punishing will bring the results. It is something requiring brains, industry and confidence.

There is no public utility man, no matter how pig headed he may be, who would not prefer, with the same profit to himself, to give first class service at a low cost and to have a group of satisfied consumers rather than the reverse.

Self education is effective because it aims at results. Too many of the pupils in our schools and colleges are studying only so as to pass an examination or get a diploma.

—HENRY L. DOHERTY.

The adoption of the Doherty three-part rate—the now common name for what was for long known as the “readiness-to-serve” rate—in Ottawa, Kansas, aroused widespread interest. Mr. Doherty had been told repeatedly that no commission would approve such a rate, and that he was foolish to try. He had been listening to such talk for twenty years, yet in 1919 a commission did approve the rate and later adopted it exclusively. The story of the rate, and the reasons for its adoption were embodied in a paper by Mr. Doherty read at the 1920 meeting of the National Gas Association of America, entitled “Service and Conservation Under the Three-Part Rate,” in which he said:



INCE some of the data which follows was obtained in Ottawa, Kansas, where the three-part rate is in effect, it may be well to summarize here some of the facts in connection with that installation.

Ottawa, prior to the installation of this rate, was being served by the Ottawa Gas and Electric Company with natural gas at a straight meter rate of 80 cents per thousand cubic feet. The three-part rate, which was substituted as of January 1st for the straight meter rate previously in effect, consists of

A customer charge of \$9 per year per customer, payable in equal monthly installments;

A demand charge of 32 cents per year per foot of maximum hourly demand, payable in equal monthly installments; and

A consumption charge of 40 cents per thousand cubic feet of gas consumed.

After the adjustment of his appliances, each customer chose such a maximum demand as, with the advice of the company's service department, he determined was necessary to supply his needs. There was installed on his service an Empire limiting meter which restricts the flow of gas to a point where the customer in one hour secures only that number of feet of gas for which he pays a maximum demand. These limiting meters are made in various sizes and were installed as follows:

LIMITING METERS INSTALLED AT OTTAWA, KANSAS

Capacity Limiting Meters Total Per Hour	Number of Customers	Per Cent. of Total Customers	Cumulative Per-Cent.	Total Demand Cubic Feet
22.5	88	4.5	4.5	1980
30	163	8.3	12.8	4890
37.5	283	14.4	27.2	10612.5
45	477	24.3	51.5	21645
50	3	.2	51.7	150
52.5	184	9.4	61.1	9660
60	234	11.9	73.0	14040
67.5	88	4.5	77.5	5940
75	149	7.6	85.1	11175
82.5	31	1.6	86.7	2557.5
90	90	4.6	91.3	8100
97.5	8	.4	91.7	780
105	47	2.4	94.1	4935
112.5	1	.05	94.15	112.5
120	55	2.8	96.95	6600
127.5	3	.15	97.1	382.5
135	2	.1	97.2	270
142.5	2	.1	97.3	285
150	22	1.1	98.4	3300
157.5	2	.1	98.5	315
165	3	.15	98.65	495
180	3	.15	98.8	540
202.5	1	.05	98.85	202.5
210	11	.55	99.4	2310
225	1	.05	99.45	225
240	3	.15	99.6	720
250	2	.1	99.7	500
300	4	.2	99.9	1200
360	1	.05	99.95	360
400	1	.05	100.0	400
Total	1962	100.00	114502.5

As one result of the installation there was a 50 per cent cut in the maximum possible demand on the lines of the Ottawa Gas and Electric Company in any given hour.

The average rate at which gas was sold in Ottawa of 80 cents per thousand cubic feet was reduced to approximately 75 cents per thousand cubic feet.

The contract which the customer will sign in Ottawa, and by which he agrees to pay a certain demand charge per year, will guarantee that demand to him at any time he may desire it within that year. Failure of the company to deliver that amount of gas at any time the customer may desire it will entitle the customer to a rebate of ten times the demand charge for the period and proportion of such failure.

The reduction of leakage that can be made without the expenditure of anything for main repairs will amount to about 30 per cent. This follows the installation of the limiting meters on the services of the customers, reducing their maximum demands and thereby reducing the pressure that it is necessary to carry in the mains.

THE REQUISITE OF A PROPER RATE

From the standpoint of equity, the rate must distribute all of the costs of service between individual customers in direct proportion to their responsibility for those costs.

From the standpoint of public policy, a proper rate must penalize extravagant and wasteful uses of gas and put a premium on its efficient utilization, while under the law the rates must be non-discriminatory.

From the standpoint of continuation of service the rates in effect must allow the company an adequate revenue to properly maintain its operating department and an adequate and efficient plant.

I believe that the three-part rate fulfills all of those conditions.

BASIS OF THE THREE-PART RATE

There are in this rate three separate and distinct charges referred to respectively as customer charge, demand charge and consumption charge.

Under the customer charge there are distributed equally to each customer those expenses which bear no relation to his maximum demand in a given hour or to his total consumption in the year. Under this heading fall the cost of meter reading, book-keeping, labor, postage and stationery necessary to render bills; the expenses of the cashier's department; meter testing depart-

ment, and fixed charges on that portion of the investment which is proportional to the number of customers on the system irrespective of their demands. The total of these expenses for a company having 10,000 customers will be practically twice that of the company having 5,000 customers and, therefore, should be proportionate to and distributed equally among the number of customers connected.

Under the demand charge there are distributed to each customer, in proportion to his maximum hourly demand, those fixed charges on that portion of the investment which does vary with the maximum demand placed on the system.

The two chief factors which determine the size of the investment of a particular company are: First, the number of customers and, second, the maximum demand that those customers place on the lines at any given time.

Our organization at one time had offered to them by-product coke oven gas, and we had two options as to where we would sell it. One of them was to a town in which we estimated we could get about 10,000 domestic consumers, and the other was a small group of industrial concerns. Either one would absorb all the gas we had available and their load characteristics were very similar. To supply 10,000 customers at fifty customers per mile would require 200 miles of street mains. These, at \$5,000 a mile, would cost \$1,000,000. In addition we would have to set 10,000 meters at about \$15 each, or \$150,000 more, making a total of \$1,150,000. If we supplied the industrial customers we would only have to supply a mile or two of pipe and a few large meters, making a total investment of considerably less than \$100,000.

The difference in these two cases then is the difference in the number of customers, of about 9,990, and a difference in investment of about a million dollars. In other words, those 9,990 additional customers required investments of over \$100 apiece. Interest, depreciation, maintenance, taxes, etc., at 10 per cent means an annual charge per customer of \$10. To this we must add the collection expense and a portion of the general expenses, which would be about \$4 or \$5 a year, making a total cost of \$14 per domestic customer.

You will say that this figure includes in the distribution system provision for demand, but the same is true for the in-

dustrial customers. The demand is the same in both cases, the only difference being the number of customers. In other words, it costs us \$14,000 a year solely because we must deliver this gas to 10,000 places on 200 miles of street instead of to only one or two places on four or five miles of street.

The size of the transmission lines is, of course, dependent on the size of the maximum demand irrespective of whether that maximum demand is occasioned by supplying one customer or 10,000 customers. The fixed charges on that investment, the size of which is determined by the maximum demand, are distributed to each customer as a demand charge. The demand charge is uniform for equal demands and proportional to the demands. This is irrespective of the fact that one customer with a 50 cubic foot demand may utilize his demand four times as long as does a customer with a 100 cubic foot demand and, therefore, may in a day or a year use twice the amount of gas.

It is clear that neither the customer expense nor the demand expense, forced on the company for service to a particular customer bears any relation whatever to the total amount of gas which that customer may use in a month or a year.

Under the consumption charge there are billed to each customer those expenses which vary directly with the amount of gas which the company must supply and these charges are billed to each customer directly in proportion to the amount of gas he consumes. As was pointed out in the paragraph on the demand charge, the customer with a 50 cubic foot demand may use twice as much gas in a given month or a year as the customer with a 100 cubic foot an hour demand.

The total cost to the company for gas alone would be identical whether they supply one customer using ten million cubic feet, ten customers each using one million cubic feet, or one thousand customers each using ten thousand cubic feet.

We have three distinct classes of cost, each of which varies with a factor that does not influence either of the other two classes. Under the three-part rate each customer is billed with each class of expense in proportion as he makes that cost necessary.

CONSERVATION

The conservation of gas that follows the installation of the three-part rate is divided into two general divisions:

First. Since the largest saving to be effected is in the homes of the customers, the gas companies have been pointing out to the public the necessity for the conservation of gas. Various branches of the federal and state governments have been printing booklets and utilizing the press to reach the public *without any appreciable effect*.

It is my conviction that until such time as the customer appreciates he is directly interested in gas conservation *no progress will be made*. In the installation of the three-part rate this direct financial interest of the customer is brought to his attention at once when he realizes that he must pay a monthly premium unless he uses the gas in efficient appliances, properly adjusted.

There is available to him under the three-part rate any sized demand which he may care to take and his demand charge is proportionate to any maximum demand he chooses. Exhibits of appliances and their varying demands indicate to him the amount of the premium he must pay for the continued use of an inefficient appliance and he at once will have his appliances adjusted if that will lower his demand charge, or he will supplant the inefficient with efficient appliances if that be necessary.

In our various surveys we find cooking ranges burning as high as 106 cubic feet per hour, while we have found it practicable to cook meals for twenty people with a demand of 30 cubic feet per hour on identical appliances *properly adjusted*.

Under the three-part rate, as installed at Ottawa, Kansas, the difference in the annual demand charge between those two cooking ranges, one properly and one improperly adjusted, would be \$24.32.

The customer also learns the saving which he would make in the consumption charge under the change in efficiency.

We have not through publicity in the past received the cooperation of the public, but there can be no question that when a customer is told he has to pay \$24 per year for the privilege of using an improperly adjusted range, he will at once have that range adjusted.

The effect of this can best be appreciated when you consider that the average demand per customer of 1,962 customers in Ottawa, prior to the time their appliances were adjusted, was 118 cubic feet per hour; that at the present time with the limit-

ing meters, installed in November, December and January, the total maximum demand that can be placed on the system by these same 1,962 customers is 114,502 cubic feet, which gives an average of 58.4 cubic feet per customer.

This does not mean that the customers had the service, which they previously received, reduced. In fact, many of these customers are getting more service at the present time than they had prior to the adjustment of their appliances, for the simple reason that under the flat 80 cent rate they could not afford to do any house heating. They now do considerable incidental heating which comes within the capacity of their demand limiting meters, for which their additional cost, over and above the cost of their other service, is only the additional 40 cents per thousand cubic feet which they have to pay as a consumption charge.

The effect on the service, from the standpoint of the company, can be realized when a comparison is made of the present maximum demand of 114,502 cubic feet with the maximum demand under the old conditions of 231,515 cubic feet in a given hour. This city at the present time has a gas service superior to anything it has heretofore experienced and at the same time the company is supplying that service with less than half of the maximum demand previously made on its lines.

Housewives find that they can boil water more quickly; that their pots and pans are not blackened as they previously were with the improperly adjusted burners. When the summer comes the difference in the temperature of their kitchens will be appreciated because of the fact the heat necessary to do their cooking is applied to the cooking utensils without a great surplus being radiated into the room, as was the case with the closed top ranges and long flames necessary before the burners were changed.

Some of the appliances which we found in use while installing the three-part rate in Ottawa were scarcely to be recognized by any but older gas men. For instance, we found star burners two in a set, which would be inserted in the fire box of an ordinary coal range and which for cooking purposes would take the place of two burners on a regular gas range. These star burners used 450 cubic feet of gas per hour, and under the Ottawa rate the demand charge alone on such a burner would be \$144.00 per year. Needless to say they are no longer in use. These star

burners were cheap from the standpoint of their original cost but the consumer paid for them many times burning gas at an eighty cent rate. Gas companies will find that the source of much of the feeling against them originates in devices like the star burner which increase the customer's bill disproportionately to the service rendered.

There is a picture in the booth of Henry L. Doherty & Company of another interesting appliance which we found and which has a demand of approximately 250 cubic feet of gas per hour. The appliance has not been named as yet, but consists of a piece of gas pipe, about four and one half feet in length with holes drilled in it, placed about four inches below a bath tub. The flames from this home made burner impinged directly on the bottom of the bath tub.

These two examples are striking, it is true, but of little importance because of their rarity.

The real conservation that was effected was in the adjustment of otherwise efficient equipment and the resulting reduction in the gas consumption.

Meritorious as the objects back of the propaganda for the conservation of gas may be, it is my firm conviction, as it is the conviction of all of the men who had anything to do with the installation of the three-part rate at Ottawa, that so far propaganda has had no particular effect upon the public mind. I doubt whether continuation of that propaganda, without the installation of a proper rate, will postpone the death of the natural gas business.

Second. We come now to another item of conservation, which, while not so large as is possible in the homes, is large enough to have a marked effect on the earnings of the distributing company and on the continuation of the natural gas service.

It will be appreciated at once that the pressure in the distribution mains to supply the present Ottawa demand of 114,000 cubic feet per hour is much lower than that needed for the demand of 231,500 cubic feet necessary under the old conditions.

Leakage is the best customer from the standpoint of load factor the gas company has, but unfortunately does not produce any revenue. It is present twenty-four hours a day and varies in relation to the pressure in the mains. A great reduction in this leakage is at once apparent when the conditions under which

the customers use gas are so changed as to enable a reduction in the distributing pressure.

We believe that in Ottawa where we have in the past had maximum pressures of from 9 to 12 ounces, it will be possible with the reduced demands to distribute the necessary gas with a maximum pressure of 4 ounces. The saving in leakage by this reduction will be effected without any expenditure in main repairs and without any reduction in the quality of service.

ADVANTAGES OF RATES WHERE SUPPLY DECLINES

Undoubtedly the conservation that can be effected in the homes of the customers and in the mains of the distributing companies by the installation of the three-part rate will greatly lengthen the life of the gas fields. It is nevertheless true that there is an artificial death date to the natural gas business that we are rapidly approaching.

With a continuation of the present straight meter rates, when the time comes that a company is no longer able to supply all of its customers, it will be necessary to pick out certain groups and entirely discontinue service to them, in order to better the service to the remaining customers.

With the three-part rate in effect we would know the maximum demand to which each customer was limited and it would be practicable and easy for the proper regulatory body to decrease the maximum demand of each customer ten per cent, for instance, by having installed limiting meters of smaller capacity. This would seem to be a much fairer method of bringing the demand on the gas company within its supply than would the method of discontinuing the service to some particular group.

Beyond the question of a doubt the remaining customers would decline to pay fixed charges on that portion of the property which had been scrapped and would decline to amortize that portion of the property from which they never had had and never would have any service.

The proportionate reduction of service would, as long as it was practicable, permit the use of gas to more people for those services where coal and other fuels stand the least possibility of competing on an economic basis. If conservation means anything it means the utilization of the least expensive and most efficient fuel for any particular operation.

If discrimination means anything it would, to my mind, be applicable when gas customers on the north side of a particular town were asked to discontinue the use of a 1,000 B. t. u. gas at, we will say, \$1.00 per thousand cubic feet, and begin using a 525 B. t. u. gas at \$1.50 per thousand cubic feet for the purpose of making good service available to the customers on the south side of town.

DISCRIMINATION IN SERVICE UNDER STRAIGHT METER RATE

Under the present straight meter rate, we have conditions whereby a customer is discriminated against because of the location of his house.

The usual natural gas towns are belted with an intermediate pressure main from which the distributing system is fed. In the ordinary town the better residences are built on the outskirts of the town. The better class of residence presupposes on the part of the owners a financial ability to buy any number of appliances they may desire. The smaller homes and flats, which on the average are occupied by people with lesser incomes, are, therefore, necessarily located farther from the intermediate lines. With the unlimited demands, present wherever straight meter rates are in use, it is impossible for the gas company to supply adequate service on cold mornings because either the gas supply or the carrying capacity of the mains is insufficient.

When the pressure begins to drop on one of these cold mornings the natural inclination is to light more appliances, with the result that the available gas went to those customers with the most appliances because of the fact that their homes naturally were located nearest to the intermediate lines.

During the extremely cold weather we have had days at a time in Wichita, Kansas, when there was no gas in the poorer homes and where some of the better residences were using from 500 to 1,500 cubic feet of gas per hour for house heating with inefficient appliances.

At the same time these larger residences throughout the year do not use a proportionately greater amount of gas. The occupants of these homes go to Florida or California after the Christmas holidays and spend a large portion of the summer in Colorado.

If there had been a real need for the curtailment of service, the curtailment certainly should have been pro-rated. However, there was no need of a curtailment of service; all that was neces-

sary was a rate which would force the installation of efficient appliances. In one of the houses, for instance, we found appliances which, in the condition we found them, necessitated a maximum demand of 2,500 cubic feet per hour. During the short time that these appliances were all in use the owner of the home was amply able to pay for whatever gas was used at any reasonable straight meter rate. Under the three-part rate his annual demand charge alone would have been \$800.00 per year, and being perfectly able to buy efficient appliances the changes which we suggested could have been effected at once and all of the service which he had previously received could have been supplied with a demand of 250 cubic feet. This would have made 2,250 cubic feet per hour available to smaller consumers on those cold mornings and would have been sufficient to have operated 75 properly adjusted kitchen ranges.

This consumer, without doubt, believes in conservation as a theory, but until its practical application was forced to his attention no progress had been made, and *the authority which permits a straight meter rate to continue is discriminating against the very class they call the small consumer and whom they have every desire to protect.*

I have cited one particularly bad case. I could, if space permitted, list hundreds.

ADVANCE INFORMATION OF MAXIMUM DEMANDS

Most natural gas companies have been most bitterly denounced by their customers for their lack of service on cold winter days. The customer does not know, and never will understand, why it is on the cold days especially that the service is inadequate.

Our service contracts under the three-part rate run for one year, as is usual with most utilities, and at any time we can tell the maximum amount of gas we can possibly be asked to supply in a given hour *within the year to come*. We can decline to sign up contracts for additional supplies when we have reached the limit of our capacity. We can apply to the commission for a pro rata curtailment of the present contracts whenever the necessity for that move becomes apparent.

We, therefore, can keep the demands on us within our capacity and can guarantee that these demands for which we have contracts will be supplied with gas not only on the 4th of July but on the 1st of January.

I need not before the members of the Natural Gas Association dwell on the benefits of such a situation.

EFFECTS ON APPLIANCES

In the preceding paragraphs, I have made reference to two particular appliances, the star burner and a bath tub heater, the continued manufacture of which ought not to be encouraged.

We found in the installation of the three-part rate that we had to educate the owners of hardware stores, plumbing establishments and department stores on the subject of gas conservation. We found many of these people thoroughly imbued with the idea that it was unhealthy and impracticable to use ranges with spider tops and short flames. Appliance salesmen selling the other type of appliances had created this atmosphere and it had to be overcome before we could get the cooperation of these people.

It is obvious that many types of appliances that inefficiently use gas can be manufactured at a lower price than can a more carefully designed and built appliance which gives a greater efficiency. The first interest of the customer is in the original price of his appliance and the conservation propaganda starts out with this very decided handicap.

Under the three-part rate, however, the additional cost of an inefficient appliance is brought home to the consumer at once, and in the town of Ottawa, where this rate is in effect, it would be hard for the most plausible salesman at the present time to sell them an appliance that was not efficient. This rate practically prohibits the sales of inefficient appliances and certainly puts a premium on the manufacture of others even more efficient than those we now have at our command. Any widespread adoption of this rate will have a tremendous effect on the engineering or research departments of every organization manufacturing appliances, and that recommendation alone ought to take the rate a long way toward adoption.

WHO IS THE SMALL CONSUMER?

Great opposition has been encountered in the past when endeavors have been made to install a rate which contains either a customer charge or a demand charge on the basis that these rates unduly penalize the small consumer. This opposition on the part of city councils, public utility commissions and other regulatory bodies has been based on the mistaken idea that the small consumer is the man in poor circumstances. A slight con-

sideration would convince almost any one that this theory is absolutely fallacious.

In which home do you suppose there would naturally be used the most gas in a year? Take first an apartment renting for \$100 to \$125 a month. Most apartments prohibit children, so we can exclude children from this family unless the poodle dog is counted. The size of the rent paid indicates that the man must have a fairly lucrative position and presupposes that he does not carry his lunch but eats at a restaurant or club down town. It is likely the man of the house belongs to the golf club and it is fair to assume that he has a vacation every year. It is perfectly safe to assume that the wife does not do her own washing or ironing; that the heat is supplied by the owner of the apartment, and that, therefore, the only uses for gas are for a light breakfast, an occasional dinner at home and no luncheon, because a family of two doing little manual labor will probably have light meals.

In a case before the Kansas commission, this particular type of customer was most aptly classified under the heading of "toast eaters."

As the other example, we have the man doing manual labor, living in a house or flat, usually with a good sized family, all of whom have good appetites. It is safe to assume that if he is paying a rent not to exceed \$50 a month, he has to furnish his own heat and that his wife does her own laundry work; that he does carry his lunch, and that, therefore, there must be prepared the equivalent of three square meals a day, together with the heating of a considerable quantity of water. In all reasonableness which do you assume would be the larger gas consumer of these two homes?

You need not depend on theory because for the year ending June 1, 1916, there was a survey made of hundreds of customers in Kansas City, Missouri, with the idea of determining what monthly rent these customers paid and what their average annual gas bills might be.

It was found that in 444 homes, principally flats and two apartment buildings, which had an average monthly rental of \$24.77, the average annual gas bill was \$25.74. For these people who had to furnish their own heat and without doubt did their own laundry work, their average annual gas bill was approximately equal to one month's rent.

An analysis was then made of 1,123 apartments which rent on an average for \$39.72 per month, and it was found that the average annual gas bill was \$14.08. Included in this latter group there were 275 apartments that had an average monthly rental of \$56.26 and for this group the average annual gas bill was only \$12.72. In the two latter classes undoubtedly the laundry work was done outside of the home, and in the majority of cases hot water was furnished by the apartment owners, so that these customers used gas only for cooking purposes.

The gross revenue for the two latter groups could not have exceeded the actual customer's expenses that service to them necessitated on the part of the company, and which under the three-part rate are grouped under the heading of "Customer Charge."

The fixed charges on the investment made necessary by the maximum demands of these customers and the actual gas supplied to them was either a gratuity on the part of the company or on the part of that class of customers, which the regulating bodies have in mind when they say "the working men," or the small consumer.

Because of the straight meter rate under which this service was being rendered these people, who could amply afford to pay the cost of service rendered to them, were nothing more than "charity patients." Under the three-part rate they would of necessity have paid all of the costs which service to them entailed on the part of the company.

THE THREE-PART RATE IN THE ELECTRIC BUSINESS

In consideration of the results that may reasonably be expected from the adoption of the three-part method of charging for gas, I believe it would be worth while to consider the comparative condition of the artificial gas plants and the electric plants in this country.

It is a matter of general knowledge that the great majority of artificial gas plants are unprofitable while the great majority of electric plants are profitable. In analyzing this situation it would be well to see what fundamental difference there is between these two classes of business.

First. They both sell a manufactured product.

Second. They both are regulated monopolies.

Third. In a given town the artificial gas plant will have more customers than will the electric plant, so that from the

standpoint of the number of possible customers the gas business is more favorably situated.

Fourth. Without question the great majority of customers in a given town if told they could have only one of the two services, would discontinue the use of electricity and continue the gas service, so that from the standpoint of comparative desirability the artificial gas plant has the preference.

The only fundamental difference between the two businesses that can account in any way for the difference in their financial condition is their method of charging for service.

At the present time at least seventy-five per cent of the electric current generated and sold in the United States is sold under some form of rate which takes into consideration the maximum demand which the customer places on the plant as one of the items on which to base a charge, and his total consumption of electric energy as another item.

Up to date, however, the artificial gas business has continued to maintain the old straight meter rate for charging, in which the total charge rendered to the consumer was based on only one factor of service, that being the total consumption.

In a preceding paragraph I have called attention to the apartment in Kansas City where obviously many customers were getting service at less than the actual cost of reading the meters, rendering the bills and collecting the accounts. Where only a straight meter rate is in vogue the loss sustained by reason of the service rendered to this class of customers must necessarily be added to the actual cost of serving other customers, thus making the good customers pay a premium for their service over and above their fair share of the cost.

The old straight meter charge naturally invites unattractive business and in proportion as it attracts unprofitable business it raises the rate which all must pay and discourages business from which a profit could be made. No industry can expect to succeed with such a program.

The three-part rate, however, in that it charges to each customer exactly the cost which service to that customer entails on the part of the company, naturally attracts more and more business from those customers to whom service can profitably be rendered at a low price per unit. Providing the unprofitable customers continue to use service subsequent to the installation of the three-part rate, they have at least to pay the cost of ren-

dering that service, and are, therefore, not a detriment to the company. Inasmuch as the psychological effect of a fixed charge which the customers must pay any way inclines them to use additional gas after having paid the fixed charges for their class of service, it tends to make good customers out of those who have heretofore been unprofitable.

There is no reason which I can see that would not make the gas business even more profitable than the electric business, providing they adopt the same form of rate schedule which the electric business that has had in force for many years. The additional business that has been attracted to the electric companies, the rapid growth of those companies and the introduction of electricity in place of other power has been induced by the form of rate which has been in vogue. The progress that can be made by the gas companies will parallel that made by the electric plants in the last fifteen years.

FINANCIAL CONSIDERATIONS

The crying need of public utilities at the present time is sufficient credit to enable them to obtain money necessary for improvements and extensions. A company operating under the three-part rate will, in my opinion, be a better credit risk for the following reasons:

First. No organization can afford to carry a sufficient number of high class men to make a careful analysis of the conditions under which service will be used by each individual customer who applies to it for service. Under the straight meter rate such an analysis of each application would be necessary to determine whether or not a new customer's business would or would not prove desirable. Under the three-part rate this analysis is made once for all and investors providing funds for extensions to take care of additional customers, who are to be billed under the three-part rate, have the assurance in advance that the company is taking on business on which they will *not* show a loss.

Second. Nearly all of the fixed charges and a considerable portion of the operating expenses are uniform from month to month. The principal variation in the cost of operation of a natural gas property is the total cost of gas, which runs much higher in winter than summer. Under a straight meter rate the company shows a disproportionate amount of revenue above operating expenses in the winter months and quite often shows a

deficit below operating expenses in the summer months. Under the three-part rate the fixed charges being provided for in the revenue secured from the customer charge and the demand charge, the total revenue follows these expenditures up and down month by month. The consumption charge furnishes the revenue to pay for the gas and varies in proportion as the gas purchased by the company must vary.

Third. The conservation of gas which follows the installation of the three-part rate tends to add permanency to any investment in the natural gas business, and, therefore, has a very desirable effect on the credit of the natural gas company operating under that rate.

Fourth. A properly devised three-part rate with a consumption charge based on the B.t.u. delivered rather than on the cubic feet of gas delivered makes it very easy to substitute a mixed or an artificial gas for natural gas as that necessity arises. This substitution can be made without any radical rate revision and with assurance to the investors who must furnish the money for the artificial gas manufacturing plant that the revenue will provide for the fixed charges on the additional investment.

CONCLUSION

The three-part rate by its very nature accomplishes the following:

First. Guarantees the customer that amount of gas for which he contracts, for every hour in the year, and makes it possible for the company to fulfill that guarantee.

Second. Conserves large amounts of gas by financially interesting each customer in adjusting his appliances to efficiently utilize gas.

Third. Conserves large amounts of gas by reducing the maximum demands of the customers so as to permit the company to supply these demands with much lower pressures in the distribution mains, thereby reducing the present leakage.

Fourth. It not only distributes the total cost of gas service to the customers as a group, but makes an equitable distribution of this cost as between individual customers.

Fifth. By conserving the *present supply*, and by making the same service possible with a smaller supply of gas, postpones the date when service must be curtailed due to the decline in the fields.

Sixth. Makes possible a pro-rata curtailment of service to all of the present customers instead of making it necessary to entirely discontinue the service to some customers when curtailment becomes necessary.

Seventh. Does away with the present discrimination on cold mornings whereby those customers nearest the supply lines use wasteful amounts while other customers do without any gas.

Eighth. Permits the company to know for months in advance the maximum amount of gas it can be called upon to supply in any peak hour.

Ninth. Puts a premium on the manufacture and use of efficient devices and holds out a prize for the invention of devices using smaller maximum demands.

Tenth. Makes a better credit risk of any company which adopts it in place of a straight meter rate.

If the man I depend upon does not make good I wonder if I am not to blame. I have tried to make great men out of the men who have worked for me rather than to pick great men from the outside.

—HENRY L. DOHERTY.

Another article on the three-part rate was prepared by Mr. Doherty in 1920, which said:



JOHN HOUSE is an average citizen. He has no income outside his wages; he lives in a small rented house heated by a coal stove in the living room, and he has a wife and four children to support. His only gas burning equipment is a gas range. On this Mrs. House cooks, all the year round, three meals a day for the healthy appetites of the family of six. This takes about 100 cubic feet of gas a day or about 3,000 cubic feet each month.

Mrs. Jones is a widow with two children and living in one of the poorer class of apartments. She does all of her cooking

and water heating on a small gas range and uses about 2000 cubic feet of gas per month all the year round.

Bill Smith is another user of gas but Bill is making pretty good money and so he has two ranges, one for coal and the other for gas. In the winter time, Bill's wife uses the coal range for most of her cooking but she likes to have the gas range handy for a quick fire in the morning, so that during the eight months of the year she uses about 2,000 cubic feet of gas. In the summer time the gas stove is used exclusively, so that during the other four months the consumption of gas is 10,000 cubic feet, making a year round average of 1,000 cubic feet per month.

Mr. Flat is the well-to-do apartment house dweller. The apartment is one of those where no children are permitted, so there are only Mr. and Mrs. Flat and their grown son; all people with moderate appetites. Heat and hot water are furnished so there is no use for gas except for cooking. Mrs. Flat has her electric percolator and toaster, which take care of most of the breakfast. The men of the family take all of their noon meals down town and Mrs. Flat is not far behind them in this respect. In addition, the family often goes out for dinner in the evening. So the uses for gas are few and the average monthly consumption during the year is only 500 cubic feet.

Now in any community there are plenty of families like these. In a small town it is almost an even break in numbers among the House, Jones and Smith types, and in the larger city there are plenty of the Flat type. Actual analyses of the gas customers in cities have shown that the higher the rent paid for an apartment, the less the amount of gas used in that apartment.

Now let us suppose that these four families live in a community where the gas company charges \$1.70 per thousand for its product and has asked for an increase to \$2.00 owing to the continued high cost of gas coal and other commodities. An examination of the company's books by the state commission shows the company is entitled to the increase and also shows that of each \$2.00 which will be taken in under the new rate only eighty cents is actually spent in making the gas, while ninety cents is spent for other expenses, such as office help and supplies, rent, taxes, etc., and the upkeep and repairs of the mains, services and meters. The other thirty cents is to go to the owners of the company as return for the use of their property.

So Mr. House, Mrs. Jones, Bill Smith and Mr. Flat, when they pay their monthly gas bills, really make the following contributions:

Payment	John House	Mrs. Jones	Bill Smith	Mr. Flat	Total
For Gas	\$ 2.40	\$ 1.60	\$.80	\$.40	\$ 5.20
Office Exp., Etc.	2.70	1.80	.90	.45	5.85
Total, Old Rate	\$ 5.10	\$ 3.40	\$ 1.70	\$.85	\$11.05
Increase90	.60	.30	.15	1.95
Total, Old Rate	\$ 5.10	\$ 3.40	\$ 1.70	\$.85	\$11.05

The largest item in the above table is John House's contribution to the office and shop expenses of the company. It is six times the amount paid by Mr. Flat and three times the contribution of Bill Smith. The Widow Jones is also paying four times as much of the office expenses as Mr. Flat and twice as much as Bill Smith.

Why is this so? It does not seem fair to either Mr. House or Mrs. Jones, for it costs no more to read their meters and keep them in repair, make out bills and collect them than it does to look after the other two. The mains of the company must be kept in shape as much for Bill Smith and Mr. Flat as for Mr. House and Mrs. Jones, for each has the same equipment to be supplied and each kicks as much if he does not get service.

Then, too, why should Mr. House and Widow Jones pay the gas company so much more profit—six and four times as much as Mr. Flat—and why should they stand the brunt of the rate increase? The investment of the company is about the same for each of the four, yet we are about to ask Mr. House to pay 15 per cent and Mrs. Jones to pay 10 per cent on that investment while Mrs. Smith gets off with 5 per cent and Mr. Flat pays 2.5 per cent, these percentages being based on an average for the four of 8 per cent. Mr. House and Mrs. Jones are already paying too much, yet we are going to ask them to pay six and four times as much of the rate increase as the well-to-do Mr. Flat.

HOW TO GIVE JOHN HOUSE AND THE WIDOW JONES A SQUARE DEAL.

This is not a difficult thing to do. If the company has only the four customers we could divide the total office expense of \$5.85 and the total profit of \$1.95 by four and find the amount which each ought to pay for service. This would be \$1.46 for the first item and 49 cents for the second, making a total of \$1.95.

The rate would then be:

For service, per meter, per month.....\$1.95

For gas per thousand cubic feet..... .80

and the monthly bills of the three customers would be as follows:

	John House	Mrs. Jones	Bill Smith	Mr. Flat	Total
Service Charge ..\$	1.95	\$ 1.95	\$ 1.95	\$ 1.95	\$ 7.80
Gas Charge	2.40	1.60	.80	.40	5.20
Total	\$ 4.35	\$ 3.55	\$ 2.75	\$ 2.35	\$13.00

John House would be better off as his bill would be reduced 75 cents instead of being increased 90 cents, while Mrs. Jones' bill will be increased only 15 cents instead of 60 cents. The other two would not be seriously hurt as they would not be asked to pay as much as 10 cents a day for the cleanliness and convenience of gas service. The company would receive the same amount of money all four of the customers would be able to use more gas for heating or other purposes at the low price of 80 cents a thousand.

However, in addition to the House, Jones, Smith and Flat customers every gas company has some larger customers who demand more service, larger pipes and larger meters than the little fellows and, therefore, should pay more. In order to determine how much more, we make a further study of the company's costs. We find that certain expenses are the same for the big fellow as for the little one and so we have what are known as customer costs, which average from 75 cents to \$1.25 per customer. In this case, let us assume it is \$1. The remaining costs, other than the cost of gas, depend upon the size of the customer's services and the amount of gas wanted at any one time. These costs can be divided according to the various sizes of meters or according to the actual measured demand of gas made by the customers. For the ordinary meter these costs would be 95 cents, so the total fixed charges of our three customers would be \$1.95, and as far as they were concerned the rate would be the same as previously shown—\$1.95 per month, plus 80 cents a thousand. A larger customer with a double sized meter would pay his dollar customer charge, but his demand charge would be doubled, making his monthly charge \$2.90. The hotel with its very large demand would pay \$10 or more, each customer paying according to the amount of service he wants.

A comparison of the bills under the two rates is interesting, and in the following table we have shown just what the monthly bills of various customers would be. The first six have been figured with a fixed charge of \$1.95 per month, while the last three were assumed to be larger customers with a charge of \$2.90.

Monthly Consumption Cubic Feet	Monthly Bill Rate of \$2.00 per Thousand	Monthly Bill Fixed Charge Plus \$.80 per Thousand
500	\$ 1.00	\$ 2.35
1000	2.00	2.75
1500	3.00	3.15
2000	4.00	3.55
2500	5.00	3.95
3000	6.00	4.35
4000	8.00	6.10
5000	10.00	6.90
6000	12.00	7.70

A glance at the table will show that every customer using more than 1,500 cubic feet of gas per month is benefited by the service charge rate. In some communities owing to a different use of gas, the figure would be 2,000 instead of 1,500, but most gas companies will come between 1,000 and 2,000 as regards their domestic customers.

Of course, the expenses of operating any company depends largely upon local conditions and the various items and charges given in the foregoing will have to be varied to suit these conditions. But every community has its House and Jones families—steady all the year round users of small quantities of gas. These folks are entitled to a square deal, and the only way to give it to them is by means of a rate dependent upon costs. Such a rate will have its three components of customer charge, demand charge and consumption charge.

There are two cities in this country where three-part rates are in effect; one of these being Ottawa, Kansas, where the rate for natural gas and service since February 1, 1920, has been: (1) A customer charge per year, \$9; plus (2) a demand charge per cubic foot per year, 32 cents; plus (3) a consumption charge per thousand cubic feet, 40 cents.

In Lebanon, Pennsylvania, since April 1, 1921, the rate for artificial gas has been: (1) A customer charge per year, \$12; plus (2) a demand charge per cubic foot per year, 50 cents; plus (3) a consumption charge per thousand cubic feet, \$1.

Condensed, the above rates mean that for natural gas service the ordinary domestic customer pays \$1.55 to \$2.35 per month

and 40 cents a thousand for gas. For artificial gas the service charge is from \$2.25 to \$3.08 per month and the gas charge is \$1.

We have in these two examples the extremes of the gas business, low priced natural gas and high priced artificial gas. In Ottawa, the first year's operation showed a decrease in the price from the former rate of 80 cents to an average, including all charges, of only 76 cents a thousand. In Lebanon, where the rate was offered as an alternative for a straight meter rate of almost \$3 a thousand for domestic users, only the first two months' figures are available at this time and these are for light consumption months, but the lack of complaint indicates satisfactory progress.

Four principal arguments used against this type of rate are:

- (1) It over charges the "little fellow."
- (2) It is too complicated.
- (3) It does not follow other business practice.
- (4) It drives customers off the lines.

(1) The first of these arguments has been gone into previously. The hue and cry raised by some politicians and newspapers have been caused by the generally misunderstood idea that the small customer is the poor man. Such is not the case. The man with a family, whose wife cooks two or three meals a day, cannot get by on less than 2,000 cubic feet of gas a month. He is the small customer who is entitled to as much consideration as any one else and he is benefited by such a rate instead of being hurt.

An analysis of the 200 smallest customers in Lebanon showed that 74 per cent were well-to-do people or were industrial users. Only 3 per cent were laborers, 6 per cent skilled workmen and 17 per cent clerks, teachers and people in moderate circumstances. However, when an analysis was made of 150 small, steady customers who saved money on the three-part rate, 52 per cent were found to be laborers, skilled workmen, clerks, etc., while only 37 per cent were business and professional men and 11 per cent were industrial users.

(2) Complications in a rate are merely a matter of a few months' bills. The customer soon gets to know his bill is going to be so much a month plus 80 cents or \$1 a thousand. He learns that additional gas is not expensive and he soon finds more use for it. This has been proven in actual practice at both Ottawa and Lebanon.

(3) The favorite question of the objectors to such a rate is, "Why can't you handle the gas business like any other business?" "Your commodity is gas. Figure your overheads, put on your price and we will pay it." "We want to pay for what we get." But do they want just that? Ask any housewife what most appeals to her about the use of gas and the answer is bound to be, "It is so convenient." Would she use gas if she has to go to the gas plant every time she wanted any? Or even 'phone down and ask to have her winter's supply sent up? Hardly. Gas customers are mainly interested in service, that definite other commodity that is rendered by no kind of business other than public utilities. They want gas when they need it and not at the dealer's convenience. Suppose the grocer were asked to be ready to delivered 5 cents' worth of goods any time of the day or night instantly upon the demand of any of his customers. Suppose he had to put a scale in the home of every customer and have an individual service for every home. Could he get by without a service charge? Not in competition with other grocers who did not have to furnish such service.

Neither can the gas company continue to get by with dealing in two commodities, service and gas, giving the more costly of the two away and trying to make up for it by the charge of the other. Gas has its competitors—oil, coal and producer gas—and it is liable to lose out if the company must make excessive profits on some customers in order to counterbalance losses on many others. This has been proven by analysis of the effect of rate increases on the revenue per customer of a number of gas companies. In recent years, owing chiefly to the increasing spending power of the average citizen, the use of gas has increased. Whenever a rate increase has been put into effect, if this increase was of the straight meter type—so much per thousand—this gradual increase in the use of gas was not only generally checked, but was often reversed. As a definite example, the average increase in the annual sales per customer of six artificial gas companies was 2,200 cubic feet for the year directly preceding a rate increase. During the year when the rate increase was in effect the annual sales decreased 500 cubic feet, while the following year there was a resumption of the increase to 2,200 cubic feet. These six companies were in different parts of the country and the increases took place at different times, so no peculiar local condition governed them.

The attached charts show comparisons of the effect of straight meter rate increases with increases involving customer charges. The first of these shows how the customer charge increases the annual revenue per customer, while the straight meter increase fails to bring in much additional revenue. The second chart shows the effect on gas consumption per customer. These charts show the gradual increase in revenue and use of gas previously referred to and how this increase was affected by rate increases.

(4) Still another argument against the service charge rate is that it drives away customers. Some convenience users of gas are driven off; customers who use other fuels than gas for most of their work. In Ottawa, Kansas, during the installation of the three-part rate for natural gas the number of customers dropped from 1,990 to 1,920, but before a year was out the number had increased to more than 2,000. In Lebanon, Pennsylvania, when the three part rate was installed 100 customers discontinued service out of a total of 1,650. Only two of these were customers in poor circumstances financially and the average use was about 500 cubic feet per month. Among other new customers taken on there was one who used more gas than all the hundred put together.

I would like to see a movement started by some one with sufficient influence to do it whereby we could impress everybody with what an honest and efficient day's work would mean in reducing the cost of living, and as this movement secures converts each of us would wear a button to show that we stood for and were pledged to do an honest day's work ourselves.

—HENRY L. DOHERTY.

The following memorandum was written by Mr. Doherty to Will H. Hays in 1920, regarding the national program of taxation and government finance.



WHEN I left you Saturday noon I knew how limited my available time would be, but I did not realize how much time would be required to make specific figures, so instead of attempting to dictate at this time a complete plan I will acquiesce in the figures regarding the now generally accepted government needs for revenue and will make this simply a preliminary memorandum dealing only with principles. I will not attempt to present it in proper sequence but will start off with a number of statements more or less disconnected.

1.—THE REPUBLICAN PARTY HAS A REPUTATION TO SUSTAIN AS THE PARTY WHICH BRINGS BUSINESS PROSPERITY AND AS VICTORY AT THE POLLS DID NOT TURN THE TIDE WE HAVE ALREADY LEARNED THAT MORE IS REQUIRED THAN THE MERE MAGIC OF SENTIMENT

For the first time in the history of this country a Republican victory has failed to bring about improved business conditions. The election failed to restore confidence in the financial markets, and things grew worse to a degree where it seemed to many that a collapse was inevitable. A change for the better occurred the last week in December, and there is now no danger of a financial collapse, although undoubtedly some of our banks are in a strained position on account of the depression in mercantile and industrial lines. We have to face the possibility of a series of failures of mercantile and industrial concerns, and we must also realize that many of our banks, especially in the industrial centers, are loaded with paper based upon mercantile and industrial stocks of materials. These have always been considered by our bankers as liquid assets, but for the present many of these stocks of materials are hardly more liquid than the bricks and mortar of the buildings in which they are stored. Many concerns are hanging on by their eyelashes, and whether they can hold on long enough to weather the storm remains to be seen.

I cannot concur in the wisdom of the theory I have heard expressed by some,—that no relief should be attempted until after the Inauguration. If we could, by accepting a drastic

house cleaning, in the next thirty days develop every weak spot and create a zero position from which we could measure the effectiveness of our future work, there would then be some argument in support of this plan. This is impossible. Every failure will create other failures, and the development of all weak spots will be a long drawn out process. The thing to do is to get to work immediately so those in difficult positions will be encouraged to hold on, and we should endeavor to create immediately better business conditions and an easier financial situation so all of these concerns, if possible, will eventually be saved and so that by no chance a succession of failures will occur after the Inauguration. The army of unemployed which must be faced and dealt with on March 4th should have as few additions to their ranks in the interim as possible.

2.—EVERYBODY WILL BEST SERVE HIS OWN INTERESTS BY STRIVING
UNSELFISHLY TO REESTABLISH SOUND BUSINESS AND
FINANCIAL CONDITIONS FOR THE COUNTRY
AS A WHOLE.

I regard the situation which confronts our country, and especially in view of the sentimental effect of almost a total cessation of foreign trade, as being so critical that all of us will fare much better by an earnest attempt to reestablish good business conditions rather than by trying to get some advantage for ourselves in the formation of our tax laws. I will go even further than this and say, wherever inequities fall they can better be borne if it enables us to get into a better business condition than to refuse to accept these inequities and thereby postpone or allow business to either remain under the present depressed condition or to continue its further trend in that direction. In other words, we would all be better off with the country shooting on all twelve cylinders, even if we have a poor seat, than with the country shooting on only six, even if we have the best seat in the bus.

The recommendations made herein are without giving any consideration as to what is best for my own interests.

I do not look with great alarm on the cessation of foreign trade in so far as its intrinsic effect upon our prosperity is concerned. There is enough internal work to be done to keep everybody employed without foreign trade until such time as foreign trade can be reestablished by natural means.

A reestablishment of sound financial and business conditions in this country will do more to strengthen the situation in the foreign countries than all of the special corporations that can be organized. So soon as our American business men can function without the handicap of either being refused the right to pledge capital for cash, or can obtain either bank or investment funds with reasonable ease and somewhere near reasonable rates, these business men will, by the very nature of their business, give support to business enterprises in foreign countries.

3.—WE CAN RAISE ANY SUM OF MONEY THAT IS NEEDED IF WE
PLAN INTELLIGENTLY.

This country is intrinsically so sound, and its resources so vast, that any sum of money can be collected that may be necessary, provided it is done under an intelligently devised bill; but any unnecessary taxes levied at this time will prove an obstacle in a greater or lesser degree to the country's future prosperity and will retard the recovery from our present period of depression.

4.—WE SHOULD AIM TO MAKE THE NEW REVENUE LAW AS PER-
MANENT AS IT IS POSSIBLE TO DO.

Regardless of the merits or demerits of our previous tariff revenue bills, we must all agree that they have carried one feature which represented an economic waste by causing a hesitation of a greater or less degree in many lines of business between the time it was recognized that a new law was to be passed and up to the time the bill had actually passed.

A proposed change in tariff always caused the dealers in imported goods to endeavor to reduce their stocks as far as possible, knowing that they would have time before the bill actually became a law to restock their shelves in event the tariff on these goods was raised, and in the event it was lowered they could then wait until the bill became a law and restock their shelves; while the American manufacturer, on the other hand, often stopped his purchases of raw material and put his factory on half time so that in event the new tariff law subjected him to a greater degree of foreign competition he would not find himself with an excess stock of either raw material or finished stocks on hand.

Our tariff legislation affected only a relatively few of our business enterprises compared with the revenue law in its present form, therefore each time the revenue law is to be reframed it will cause a much greater degree of business disturbance than has ever been caused by the tariff. For this reason it should be carefully enacted at this time so it will not have to be changed in the near future, and, if possible, sections dealing with income taxes, taxes on corporations, and practically all other internal taxes, should be passed covering a definite governmental policy so that in event less or more revenue is needed there will not be a change in the nature of the bill but simply an increase in certain character of taxes, or a decrease of these taxes or their abolition.

If anybody has ever attempted to compute the sum of the economic waste occasioned by the passage of such a bill I am unable to point to it, but the loss is certainly very large in the aggregate, and I would not be surprised if the loss, directly and indirectly, would amount to as much as the tax collected in a single year.

5.—A TAX BILL CANNOT BE INTELLIGENTLY DEvised UNTIL THE
GOVERNMENT HAS DECIDED UPON PLANS FOR PAYING OR
REFUNDING OUR FLOATING DEBT AND
MATURING BONDS.

The tax bill of course will have to be framed in accordance with the needs of the government. It is my opinion that the estimated amount of revenue is greatly in excess of the government's needs. I will not go into the matter of government expenses because I am not qualified to give valuable information—although I can say what many citizens must realize, that our federal government has enlarged its activities, and has become engaged upon new ones that were never contemplated in the original plan of our government, and that we are now subjected to an expense so huge that the necessity and needs for it could not be comprehended by the men who planned our government. If these men could, by some magic, be brought back to life they would be so shocked by the magnitude of these expenses that they would drop dead again.

Our government's business and financial affairs have now reached a condition requiring a reorganization, just as we would have to do with a private corporation which had over-strained

its credit and allowed its operating expenses to run beyond reason. If we were dealing with a private corporation we would not jeopardize getting it back into a sound position by loading it up with heavy sinking funds during the period of rehabilitation—and I recommend that the same plan be followed for the government.

Unless we find we can pay our floating debt and maturing bonds as they come due without the necessity of drastic tax measures, then I recommend that the floating debt be funded at once, and as bonds come due in the next three years that they also be refunded. I am fully conscious of the fact that bonds now sold will have to be sold largely as a matter of merit, and will have to show a better income than the income yielded from the outstanding bonds when bought at market price. I also appreciate the fact that a new flotation of government bonds of a similar character as the others, and sold to the same class of buyers, will have a depreciating effect on the market value of the present bonds.

However, regardless of what plan is used, we cannot consider our tax problems as being separate and distinct from the financial operations of the Treasury Department, or the part which will be played by the Federal Reserve System and the banking institutions of the country and their depositors.

For approximately fifty years business and banking was conducted under a banking bill which was confessedly inadequate, and which had been primarily designed to insure the sale of government bonds issued at a previous period of great government stress. We all acquired habits under that bill contrary to habits that should prevail under an elastic system of currency, and nothing short of widespread planning and education will enable us to function properly and realize all the advantages from an elastic system of currency.

Our Federal Reserve Banks ceased to function as an elastic system of banking more than a year ago, and since that time we have been on a system of rationed loans such as prevailed in former times of stress under our old banking bill. Our first effort should be to reestablish the Federal Reserve System as an elastic system of currency.

It is my opinion that the strain on our financial system which caused it to fail to function as an elastic system of cur-

rency was largely due to the fact that we took our mobilized bank capital for the purpose of carrying the government's floating indebtedness. This should immediately be corrected. Perhaps a better method can be adopted than the one I am about to suggest here, but my recommendation is the best I have been able to think of. It will solve our banking troubles and fund our government's floating debt, and lay the foundation for unifying and refunding our entire debt.

The government's floating indebtedness should be put into the form of what we will term, subject to a change in name, "Government Bills." For the present the longest maturity will be a twelve-months' bill, and some bills will come due each month. The banks will be asked to ratably make the initial distribution of these bills to their larger depositors. The Stock Exchange will be asked to make an active market for these bills.

By having some of these bills come due every month those who are hoarding money in their own bank accounts against some future definite need can buy the bills of whatever maturity will give them their money in time to meet their needs—which cannot now always be done with government obligations having only six months due dates. For instance, the corporation which deposits a fixed amount of money each month to meet its interest which is due on June 1st would not look with favor on buying government obligations having a due date on July 1st.

Under fifty years of operations of an inelastic currency all corporations, and many individuals, became accustomed to carrying bank balances greatly in excess of any reasonable need, but with a view of taking care of themselves in the event of a money panic without calling upon their bank to do so for fear that when the time arrived their bank would be unable to do so.

Stockholders have become accustomed to look at a corporation's report to them with more or less nervousness unless it shows a huge cash balance. In my opinion, the corporations can readily be induced to carry large amounts of what has heretofore been cash in the form of government bills, and that an active market can be created for these bills so they can be gradually lengthened as to their date of maturity. When a sufficiently active market has been built up for these government bills the buyer will learn that he does not have to wait

for the maturity of the bill to get his money but that he is always assured of a market for its sale which will give him back his money at any time.

It will also be a method for employing funds that are available but which otherwise must remain idle because there is no place now to invest them which insures their return when they are needed. There is now no way to earn interest on these idle funds except that which is provided by the call money market, and this cannot and would not be extensively used by the private or corporation depositor.

I make the prediction that if this plan is used you will within eighteen months see short time government bills sold in the market at a price yielding less than $2\frac{1}{2}$ per cent per annum—and this form of financing will tend to bring back all government bonds to par or to a premium, and will make it possible to work out an early refunding of the government bonds, if this is decided upon. I also predict that this will almost immediately permit the Federal Reserve System to function as an elastic system, and this in turn will arrest the rate of business demoralization which is now the order of the day and will bring about a turn in the tide and a reexpansion of business, thereby increasing the taxes the government will receive under the new revenue law without the necessity of changing the law—all excess taxes can be used for the purpose of reducing the government debt.

In advocating a supreme effort to bring about an early resumption of the Federal Reserve System so it can give us in truth an elastic system of currency, I have in mind that there are many business activities that could furnish employment for a large number of those now unemployed but which are now temporarily held in abeyance because loans can neither be had from the banks nor can obligations be sold in the market, or, if so sold, only at such extreme rates of interest as to be an effective barrier.

6.—THE DETERMINATION TO LAY HEAVY TAXES AGAINST WEALTH
HAS REACTED TO THE DETRIMENT OF THE GOVERNMENT
AND THE WAGE-EARNER.

The present revenue bill, and the one which preceded it, were drawn under great stress and under conditions which prevented the problem from receiving dispassionate consideration.

We were all more or less in the dark as to what the effect would be, and many of the things which seemed obvious to some of us could not be made apparent to the great mass of people of the country, and time and conditions were not auspicious for a preliminary educational campaign. Congress felt at that time that the most important thing was to raise this revenue without risk of further inflaming a large mass of people—and when you remember how fearful we all were lest large numbers of our population would hold self-interest above patriotic interest perhaps Congress was right at that. One of the members of the Senate Finance Committee in a discussion with me spoke of the bill as having been designed to lay the burdens of taxation on the fewest possible number of voters.

Nearly everybody connected with the Government in any capacity seemed imbued with the idea that the wage-earner and the small salaried people of the country were unwilling to bear any portion of the necessary tax burden, and that it would be dangerous to ask them to do so.

That the workingman's breakfast table should not be taxed seemed to be a particularly pet hobby—and I stated at the time the bill was planned that it was far better that the workingman should have food on his table that was taxed than to have a breakfast table bare of food which was not taxed.

While of course the bill was not passed for the purpose of crucifying business and causing the vast army of unemployed which now exists, nevertheless, in many particulars it could not have been made more effective in accomplishing this result had it been purposely designed with that object in view.

Not only that, but the attempt to tax wealth was carried to such an extent as actually to bring about an alarming reduction in the government revenues, and this reduction will continue until certain features of the present bill are modified.

It is my opinion that the heavy surtaxes have been more of a harm to the country and to the government than any other one feature of the law—although I do not regard this feature of the law as being as unjust as some of the other features of the law. We must recognize, however, that any system of heavy surtaxes will make it absolutely impossible to maintain a volume of business sufficient adequately to employ our people, and that idleness and suffering will be widespread.

The man who now comes in the top brackets pays 73 per cent of his income to the government, which means that he must earn from a business corporation security 3.7 times as much as from a tax exempt city or state security. In other words, if he can get a 6 per cent return from a tax exempt security he would have to get 22.22 per cent return from a business corporation security. Or, stated still another way, \$1,000.00 invested in tax exempt securities will yield as much as \$3,700.00 invested in business corporation securities.

The above refers only to the Federal income tax, and it must not be lost sight of that business now must not only figure on a Federal income tax but a State income tax as well. Many of our states are finding their old sources of taxation inadequate owing to the cessation of liquor revenue, higher state expense, and soldiers' bonuses. Therefore the man of large income has this added tax to prevent him investing his money in business corporation securities, which gives employment to our people, and causes him to buy tax exempt bonds of his own state. Also it must not be lost sight of that the vast army of unemployed men is bound sooner or later to cause a huge agitation for the stimulation of public works, such as road building, street paving in cities, and the erection of city halls and state buildings, and that such activities will permanently divert capital from the support of industries which already need money and which may cause these industries to go into financial bankruptcy and later into physical decay.

Vast sums of money are needed to change over our industrial institutions from a war to a peace basis, or to repay the floating indebtedness which was incurred in bringing about this change. We have heretofore depended upon the capitalists with large incomes almost entirely to provide the money needed for expansion or change in business conditions that the country might require. Those with large incomes are not only not buying more securities of this type but are going to their strong boxes and taking them out and selling them on the market for what they will bring and buying tax exempt securities in their stead. They, by the forced sale of these securities, have depreciated the value of these securities to such a point in the market that it is no longer possible now for many lines of business to issue securities which will compete with them in safety and

income yield and at the same time maintain the institution that issues such securities on a sound financial basis.

I am trying in a measure to offset this by inducing the people of this country with small incomes and not handicapped by these heavy surtaxes to become investors in business corporation securities, but this is more or less a long drawn out process.

The heavy surtaxes are proving an effective barrier to business in other ways. For example, here, we will say, is a group of men who have developed a profitable business and which is capable of enlargement. They are unable to provide the capital for this enlargement and yet, on the other hand, they cannot afford to sell the business to others who might carry it on on an enlarged basis, employing a greater number of men, because of what the new purchaser would pay for the property only perhaps as much as 27 per cent would remain in the hands of those who sold. Still another example might be taken from a piece of real estate which has for some reason or other advanced in value, and yet the owner will not sell it even to the man who would buy and build on it because such a large portion of his profit would be taken by the government.

There are so many tax exempt bonds outstanding as to represent almost an inexhaustible reservoir, and instead of financial operations going on for the purpose of bettering business conditions our markets are largely occupied with traffic which represents only an exchange from one class of securities to another—which not only does not benefit business but which interferes with business. Not only is there a huge reservoir of these securities but the agencies which created them are still in existence and, with a steady and favored market for these securities, and with an army of unemployed asking for employment, they may enter into all sorts of extravagant and foolish undertakings, issuing large additional quantities of these securities.

It is my present opinion that if the normal tax, plus the surtax, exceeds 25 per cent as a whole, that the government will collect less rather than more revenue, and any heavier tax than this will make it difficult for business properly to function and will prevent the reestablishment of business conditions which will furnish employment for our people.

If, as Congress seemed to think, the wage-earner and the small salaried man insisted that extreme burdens be laid upon the rich, then they can have the satisfaction of knowing that their desire to tax wealth and their unwillingness to bear any portion of these burdens has forced more than three million of their fellow workers into idleness.

Surely intemperance of thought and intolerance of opinion must not be allowed to continue to rule our actions when any thoughtful man can see in advance the widespread misery it will cause.

7.—TAXES ON CORPORATIONS ARE UNJUST AND A DETRIMENT TO OUR WELFARE.

Civilization could never have advanced to the point where so many of our people can in normal times live in relative comfort had it not been for the wisdom of enacting laws permitting cooperation of small capitalists to form incorporated companies whereby those who are not themselves possessed of sufficient riches to carry on a business of their own can cooperate with other small capitalists and provide any sum of capital that may be necessary to meet, match or exceed the greatest fortune of any private individual.

In most cases the corporation is merely a convenience to the rich man but an absolute necessity to the man of small capital. The corporation is by nature, and is rapidly becoming in fact, the poor man's partnership. Any taxation laid on the corporation by the state or federal government other than the actual expenses of maintaining government activities required by these corporations over and above those which would be required from men of large private fortunes carrying on the same activities are unjust, inequitable and a disadvantage and discouragement to the small investor.

We have just seen in the example given in the preceding section how intolerance of opinion can bring about difficulties to our workers even to the point of producing widespread misery. Surely things that are obvious ought in some way be made simple by those who possess great minds to the great mass of our population that have heretofore not been called upon to think about these things rather than to wait until they are forced to learn by the injury which they have suffered.

All taxation laid on corporations over and above the expenses they cause our government is double taxation and a retardation to business. It is one of many things in which intelligence, for the lack of courage, compromises with thoughtlessness, intemperance, intolerance and ignorance.

Those who want to lay heavy taxes on corporations can never be satisfied as to the amount of these taxes if we admit that corporation taxes are just, but there is no need for a controversy as to the amount of these taxes if we show, as we can do, that all taxes laid upon corporations is double taxation yet nevertheless at this time and in this emergency consent to have the corporations taxed. We should at this time, however, make it plain that corporation taxes should be eliminated at the earliest possible moment. If corporations are to be taxed, it is my opinion that an excess profit tax is less harmful to business than any other form of a corporation tax.

8.—THE TAXATION OF SURPLUSES IS UNNECESSARY AND DANGEROUS.

I note that it is proposed by some to tax corporation surpluses to such an extent as to force them all to be paid out as dividends. In my opinion, this will jeopardize our industrial stability to such a degree as to make the plan absolutely vicious. If we formulate a tax bill permanent in character as to our income surtaxes there will be no tendency to withhold earnings that would otherwise be paid to stockholders as dividends. Perhaps some corporations have been building up surpluses instead of paying dividends, but there would be no advantage in doing this if surtaxes were fixed at a point where they could be borne and kept substantially at this point until our war debt was paid. In fact, under any graduated income tax the government would profit by any attempt to defer the distribution of earnings. The failure to pay out maximum dividends in any one year would increase the dividends paid out in subsequent years and thereby increase the amount of the government tax by carrying some of the stockholders' income into a higher bracket.

Surpluses are in the nature of a contingent reserve to provide against unexpected depreciation and emergencies which cannot be foreseen, and are absolutely necessary to maintain the credit of business and to tide them over any period of difficulty. While it is true that surpluses are almost universally

invested in more property, they always justify the continuation of the stockholder's income, provided the cash can be raised to pay it.

To attempt to force out the payment of all earnings on the same basis as might be done at the end of a day by a couple of peanut vendors, strikes at the very root of the credit of our business institutions and jeopardizes the business stability of the entire country.

9.—IF YOU ARE GOING TO DEPEND PRIMARILY UPON AN INCOME TAX
MAKE IT DEMOCRATIC IN CHARACTER BY TAXING A LARGE
RATHER THAN A SMALL NUMBER OF OUR PEOPLE.

In my opinion, it is absolutely necessary to adopt either a turnover tax or sales tax or to levy an income tax on everybody, no matter how small the income, stopping only at the point where the tax received costs more to collect than the face value of the tax.

I know that it is a general theory that blind taxes, called by some economists unconscious taxes and by others indirect taxes, should be used, but in my opinion we would be far better off using what I will call a conscious tax in the form of a direct income tax.

First, I believe we should face the necessity of making our population realize that they must bear some portion of the cost of our government. In my opinion, this would in the days to come bring about a greater degree of government efficiency and make our citizens more loyal instead of less so. I am fully conscious of the fact that the average politician has not the courage to do this, but I feel that enough public support could be had from what might be termed the "key men" of every group to make this plan popular with the majority of our people. We are too apt to assume the unwillingness of the small wage-earner and the salary-earner to pay his share of the debt.

However, if this cannot be done, then you must resort to a blind or an indirect tax on the man of small income for the welfare of this very class of people, because they cannot continue to load the burdens onto others and still have business function to a degree that will furnish them all with employment.

No matter whether all incomes are made taxable, or whether the present limits are changed, everybody should either be com-

pelled to make an income tax return or take oath that their income is not equivalent to the amount that is exempted. Vast numbers of people who should under the law pay an income tax are now making no tax return and are thus escaping taxation.

Personally, I favor making all incomes taxable except those that are not worth while to collect in preference to using a sales or a turnover tax. I would make no exceptions whatever except exemptions for the support of others who are too old or too young to work, or those who are otherwise incapable of working, and not simply an exemption because they do not work—and I doubt if I would make an exception for the wife of the married man who has no children as against the bachelor, for, generally speaking, the married man with the right sort of a wife is no worse off than the bachelor for the wife presumably is a real help to him. However, in all cases I would make an exemption for the wife who has children.

The 1918 income tax was paid by only 4,425,114 people. Probably one-third of these were not workers, being represented by pensioners, widows, children, aged, retired and miscellaneous heirs. This indicates that only 2,950,076 salary and wage earners paid a tax.

Now, here are some hasty figures which seek only approximate accuracy but are indicative:

Total population	110,000,000
Too old or too young to work.....	33,000,000
Leaving of working age.....	77,000,000
Women	38,500,000
Men	38,500,000
Working women, say.....	12,800,000
Total workers	51,300,000
Workers paying an income tax.....	2,950,076
Workers not paying an income tax.....	48,349,924

The above must convince every thoughtful man that something is wrong, and that is why I suggest taxing all incomes and discontinue allowing an exemption of a base sum.

It will probably be urged that the Treasury Department cannot attempt to collect small income taxes. This I would like to see made a special issue as a means of demonstrating to the people of this country the extravagance of all of our govern-

ment activities and also to enable the people of the country to be properly informed so they can give equitable consideration to the needs of our public utilities.

I prefer to increase the number of those who pay an income tax rather than to use the sales tax, principally for the reason that can be shown by the example of two men working at the same bench and receiving the same wage, one being a married man with, we will say, six children to support and the other being a bachelor. It is quite obvious that under a sales tax there is no way of not laying greater hardships against the married man than against the bachelor, while under the income tax we can make exemptions which will quite nearly equalize this.

I would provide in my exemptions that children and others dependent upon their father or others for support should not have any exemption if their own earnings amount to as much as the exemption, and that all earnings of the dependent would act to reduce the exemption in the same amount.

A public utility is generally expected to furnish a meter, take care of connections for gas or electricity, read the meter twelve times a year, and make and collect the bill, and yet the public are unwilling to permit the public utility to charge as much as \$12.00 a year for this service—and in many cases refuse to allow them to charge even \$6.00 per year. Now, the Treasury Department does not have to make out the bill but the taxpayer makes out the bill—and the Treasury Department can enforce almost any rules that it wants to regarding the collection of the bill, which the public utility cannot do. So I think nothing but good could come from forcing the Treasury Department to state just what their expense would be per taxpayer and then we will have the evidence of the government as expressed by the Treasury Department as a precedent to warrant our public utility commissions to allow our gas and electric companies to make a service charge. The public utilities are in a precarious condition and they in turn are a threat to the banks and insurance companies that own their obligations and therefore are a national menace. The public objects to this service charge, regarding the expense to the company as a mere trifle, yet condoning a division of the government in extravagance of expenditures that would make an alarming contrast and clearly show the unwisdom of further extending government activities.

10.—MAKE THE REPRESENTATIVES OF LABOR EITHER SAY THAT LABOR
IS UNWILLING TO BEAR ANY PORTION OF THE NECESSARY
TAX OR ELSE MAKE THEM SAY THAT THEY WILL
AND TAKE THE RESPONSIBILITY OF SAYING
WHAT CHARACTER OF A TAX
THEY PREFER

As for the attitude of those who earn small wages and small salaries, I cannot concur in the belief that these people wish to shoulder all of the burdens of our present debt onto others; and I would welcome an opportunity to say to those employed by the organizations with which I am connected, and which approximate twenty thousand, that I do not believe they want to do this, or that they should do it. Or I am perfectly willing to say to the heads of the various divisions of organized labor that, while I do not think this is their attitude, nevertheless if it is I regard it as both unwise and unpatriotic.

The war debt was not incurred solely for the preservation of the property or the income or the lives of capitalists; nor will we have a thoroughly self-respecting citizenship so long as some are willing either to demand or accept charity.

I suggest we get some one who has the courage of his convictions to take such steps as will secure from labor an expression of their objects. If some better method cannot be found, I suggest the following—and I am willing to be the goat.

I will address a letter either to Samuel Gompers of the American Federation of Labor, or to him together with the chiefs of all of the railroad brotherhoods, and will release the letter to the press and also insert it in the Washington papers in a paid advertisement. The letter will be carefully written, but somewhat along these lines:

Gentlemen:

When the present Revenue Bill was passed I was strongly of the opinion that it was both unwise and unfair to attempt to lay so much of the burdens against the corporations of the country and those having large incomes. I was in favor of some form of taxation that would secure some contribution from practically all of our population and would not place such a burden upon the business interests of the country as to jeopardize our ability to continue our business activities at

least to an extent which would keep all of our people employed.

Practically all of those having to do with the passage of this bill seemed to think the wage-earners of the country and those having small salaries were unwilling to bear any portion of paying either the interest or the principal of our war debt.

At that time it was suggested that a moderate sales tax be used, but it seemed to be a pet saying that the poor man's breakfast table should not be taxed. I said there was no reason for anybody in this country to be poor except those who are lazy or those who are physically or mentally weak, and that it was far better for the man of small income to have food on his table that was taxed than to have an untaxed breakfast table on which there was no food.

The Revenue Bill as passed at that time has played havoc with business, and is the principal reason for our now having an army of unemployed men—which is still growing.

I have been a workingman, and will always be a workingman, although I am a capitalist also.

I do not believe that there is any class of our population who are unwilling to share some portion of these burdens, and I feel that the position taken by those who had to do with the passage of the Revenue Bill as to the attitude of the wage-earner was due to some misconception.

If this is the position of the wage-earner, it should be made plain to the country. If it is not the position of the wage-earner, then some one should attempt to speak for him and tell just what portion of these burdens he feels he should bear, to what extent he is willing to bear these burdens, and just what sort of a tax he prefers.

I do not know to whom I should address this letter, therefore I am addressing it to the gentleman named above, and am taking the liberty also of giving it out to the press so that anybody interested in the subject may know what my position is, and am also publishing it as a paid advertisement in the daily papers of Washington.

In my opinion, the present Revenue Bill has worked vastly greater hardship to the army of men who are now unemployed than any harm a reasonable tax could possibly have done to the wage-earners as a whole; and I am earnestly striving, so

far as I am able, to do my share toward establishing business conditions which will insure employment for all, and at fair wages.

Would you be willing to sit in at a conference with me at an early date—or if you prefer, with other people who are cognizant of business conditions—and discuss this tax matter, and decide what in your mind is fair to the wage-earner, and then be willing to recommend what you believe is fair to the Ways and Means Committee?

Yours cordially,

HENRY L. DOHERTY.

I do not think I will undertake to determine how much revenue we must raise, or what revenue these various things will produce, until you have had a chance to think over what I have said above, and especially whether it is too far a cry to expect Congress or the laboring man to consent to a tax on small incomes.

I have given no study to the question of revenues from our tariff. I am inclined to think that on this matter you will probably have to put me in touch with some one who can speak more or less anticipatory of what the idea will be regarding the tariff of the new administration. You can decide whether we had better maintain this as a statement of principles, or whether we had better work out what our internal tax schedules will look like.

I am afraid that if I had to describe the modern reformer with which I have lived—and I have known most of them personally—I would say that they were men who were so unconscious of their duty to their fellow men, or who were so selfish that they were willing to use the great big human problems as so many brick bats out of which to build a pedestal so they could get their shoulders above the balance of the crowd.

—HENRY L. DOHERTY.

There was a great deal of excitement about a possible oil shortage in 1920, and one of the news syndicates asked Mr. Doherty to express his views. A copy of one of the articles containing Mr. Doherty's statement follows:



HERE'LL be enough for us and our children and our children's children," answered Henry L. Doherty when approached for his opinion on the gasoline situation. "I said this a few years ago when a similar alarm over the failure of the oil supply was rife, and I am still of the same belief." As Vice-President of the American Petroleum Institute and Chairman of its Committee on Cooperation with the National Automobile Chamber of Commerce, besides being a large holder of oil lands in the Mid-Continent and Western fields, and representing one of the largest oil producing interest, he can speak with the greatest authority.

Continuing he explained, "The present is merely an emergency situation and represents nothing permanent. The truth of the matter is that the shortage now existing is due to our unwittingly letting ourselves get on the verge of a famine, and by failure to recognize the increase in cost of production and by some raising the price of crude oil. In our anxiety to supply the needs of the army we strained ourselves, drilled up reserve acreage without creating a corresponding amount of new reserve acreage. As a reaction, perhaps, we have allowed production to fall off since the war. For another thing we have placed too much reliance on the Mexican and Texas fields to the neglect of other sections.

"The present increase of price is purely a result of the inexorable law of supply and demand, but I do not anticipate even under existing conditions that the retail price this summer will go much above present prices after which there will be a decline in the price to something approaching former levels. It is a matter of stimulating production activity and a greater use of cracking processes. As I have said we have allowed production to fall behind, but we are obtaining now a yield of 70,000 barrels daily from the Mid-Continent fields alone, and there is nothing in the world to hinder a far greater yield except want of labor and well-drilling equipment to extend the field of operations. Crude is today bringing \$3.50 a barrel with a premium of 50 cents

a barrel being offered. Personally I dislike to see a higher price offered, which may sound strange, coming from one interested in oil production, and, while I say it from other reasons as well, there is still an element of selfishness in it. What it would mean would be increased wildcatting activity with the result that drillers would be hired away from regions of present high productivity to less certain ones, aggravating the existing shortage of supply instead of relieving it.

"We are by no means getting the maximum yet out of the crude. We are endeavoring to supply an unnecessarily high grade for summer use. It is my contention that the present grade should be maintained in the winter, taking only that which distills over at say 430 degrees but that in the warmer weather we should take a deeper cut into the kerosene series and let the distilling temperature go as high as 485 degrees.

"There is an unreasonable prejudice on the part of the public against other than a water-white product, which is a hindrance to the obtaining of a greater percentage of motor fuel from the crude. If the truth were known a thoroughly satisfactory fuel, but slightly off color, is obtainable utilizing a larger fraction of the crude.

"No, we are a long ways yet from exhausting the resources in this country. Our companies have 4,000,000 acres of reserve oil land. More oil is coming in now from Mexico and there is an untold supply still untouched in Central and South America. Eventually we shall become a big oil importing country, but this is in the far distant future. We have very extensive shale deposits which as yet are practically unworked and offer great possibilities, while there is always alcohol—and other things—to fall back on.

"An ever increasing use of gas oil (oil used in place of coal for the manufacture of illuminating gas) is a factor in the present excessive demand. My formula for the conservation of our oil resources is a greater use of water power where coal is now used, releasing coal for greater use where it can replace oil, leaving all possible oil for use where it alone will answer. Water with vast potential power possibilities is finding its way to the sea unutilized, and because of its convenience too much oil is being burned where coal would do. An advancing cost of oil fuel appears to be the only deterrent to this extravagance.

"Considerable is heard of gasolene substitutes. The most promising of such as have been so far offered are those consisting of 80 per cent or so of a heavier petroleum with the volatility increased by the addition of alcohol. To my way of thinking the same result—an increase of the volatility of the heavier petroleum—can be better secured by cracking it.

"It is very much to be regretted that this wave of hysteria is sweeping over the country for it has no foundation other than a temporary shortage, as I have explained, and it is but another of the effects of readjustment that follow as an aftermath of the war. There is some excuse for the automobilists worrying, being naturally less fully informed as to the true situation, but that the same feeling has taken hold of some of those in the oil industry is unpardonable, for they should know better.

"I get a little out of patience too with those who undertake to estimate the resources yet unearthed and to predict when the supply and the optimist who holds that this will never happen—being can possibly know. Were this not so we could not have the two extremes—the pessimist looking for an early failure of the supply and the optimist who holds that this will never happen—and both defying contradiction.

"Frankly I cannot see any cause for worry over the future of either the car or the oil industry during the next two generations to come and by that time some other means will have been evolved for the continued supply of power for automotive transportation. Let the automobile manufacturers go right on making them and the dealers go right on selling them for the users will have the wherewithal to keep them running for a long time to come."

And Mr. Doherty knows whereof he speaks.

The man who both in word and thought is the most considerate of his fellow employee is the man to promote if other conditions warrant it. It is this virtue that permits an organization to be woven together as a single family.

—HENRY L. DOHERTY.

For the New York Tribune Mr. Doherty prepared an important article on thrift, entitled "Never Such Opportunities as Now," which was published in November, 1920, and said:



OUR national vice is extravagance. We have many people who resent the fact that other people have accumulated wealth and they have not, and yet there are dozens of men I have known from boyhood who have consistently spent everything which has come into their hands, and were temperamentally so constituted that they would have spent every cent they received, no matter how much it might have been. It may seem like a fool question, but the man who has no capital and resents the fact that others have should seriously ask himself:

"How long will it take me to get rich if I continue to spend everything I get?"

A determination to save, if carried to fruition, teaches a man how to spend intelligently and how to get the greatest value for what he must spend. Intelligent and discriminating buying would, to a great extent, make profiteering impossible.

If thrift could be made pretty much a general thing throughout this country its effects would be more far-reaching than most people imagine. It would mean better morals, less misery and greatly lessened demands for charity. Trace back every individual case of the need for charity and see how far you have to go to find that the need is due to lack of thrift.

THRIFT AND CRIME

Trace back the history of every crime and every criminal and see how often crime and criminals are the result of lack of thrift. I asked a celebrated police officer several years ago what would be the reduction in crime and prostitution if thrift were generally practiced. He did not then think it would bring a very great reduction, but he never forgot our conversation and generally referred to it whenever we afterward met, and each time he would estimate a greater reduction in crime and prostitution, and he said the last time we talked that if thrift were generally practiced crime would be reduced by 60 per cent and prostitution by 50 per cent.

To start and maintain a consistent plan of saving requires more self-will and determination than many persons possess.

When they reach a certain point, however, it ceases to be a hardship to them and becomes a pleasure. It has taught them how to save, how to spend and how to invest, and often leads to a fortune so vast as to be unnecessary and troublesome and of no use except the fun of playing the game.

This is the day and age of opportunity, and we live in the country of the greatest opportunities. Opportunity must pass each man's door not once, but often.

But opportunity is not apt to stop and knock at the door of the man who is but an indifferent workman. Most fortunes have been built from surprisingly small initial savings, but when opportunity knocks the man who has neither savings nor credit must let opportunity go elsewhere, and opportunity will seek out the man who is known to be thrifty.

THE WHY OF RICH AND POOR

The fact that saving and investing are first a hardship and later a pleasure, and often become a mania, is one reason why, on one hand, we have many people who are quite rich and, on the other hand, a great many more people who never have anything ahead; and this in a country where opportunities are very nearly equal. But still more remarkable is the fact that for every rich man who makes a fortune we can all point to a dozen men who had greater natural advantages to make their fortunes, but did not.

We are told that the rich are getting richer and the poor are getting poorer. That is plain "bunk." The great majority of the rich people of today were the children of the poor people of a generation ago.

Many people are discouraged from saving in the belief that all of the wealth that can be accumulated has been accumulated. This is ridiculous. Nobody knows accurately at this time what the accumulated wealth of the entire country is, but relatively it is quite small when measured by rational standards. For centuries we have been converting the national resources of this country, which cost us nothing, into wealth, and yet the entire savings which represent our accumulated wealth, both private and public, would not be sufficient to support us on our present scale of living for a period of ten years, even assuming we could convert this wealth without loss from the form in which it now exists into the things we would need to live on. In less than ten

years everything, including the house over our heads, would have to be sold to furnish us with what we consume.

WHAT SAVING DOES

Here is another example: If the workers of the country should save 10 per cent of their salaries and wages, and these savings were invested at 6 per cent interest, they would in a single generation accumulate more wealth than has been accumulated in all of these centuries and all of these generations.

Here is still another example: If one family had come to this country at the time Jamestown was settled with a capital of \$7,000, and this fund, together with its proceeds, had been continually invested at 6 per cent ever since, this one family alone would now have a greater wealth than our entire accumulation of wealth.

Every one working for better morals, better citizenship, better conditions of charity subjects, can perhaps attain the desired end more quickly by working to make thrift universal than by working along his present lines.

People ask: "What is the greatest problem which confronts this country?"

Answering the question broadly, I would say it is the difficulty of getting our people to think seriously and think correctly. If we could do that we would soon get all of our problems behind us.

Many people are physically lazy, but most people are mentally lazy. The person who is physically lazy will do no more work than is necessary, and is very well satisfied with the job. The person who is mentally lazy will do no more thinking than is necessary, is always willing to jump to a conclusion, and is generally pretty well satisfied with the job.

Passion and prejudice are foes to correct thinking, and never during my life have I seen so many dissatisfied people and so much passion and prejudice.

The thing we call common sense is the most uncommon thing in the world. Elbert Hubbard used to say we are not punished for our sins but by our sins. The troubles which now confront us are the inevitable punishment for our past follies.

THE CITIZEN'S DUTY

The press, the platform, the pulpit and the politicians have continually and for many years, with impassioned word pictures,

told what the country owed to its citizens, and too little has been said about what the citizen owed to his country. Every orator has prated about democracy. Perhaps those who talk so much about democracy mean something in harmony with our present government, but some of our citizens and many of our alien population to whom they talk think of democracy as a form of government which will give them all of the protection of law and order, but under which they can set up their own code for their own observance of law and order.

Thousands of our citizens are ready to advocate or support a change in our plan of government, and yet they never had the most remote knowledge of the plan of our government. It is as though some great architect had planned and built a wonderful piece of pure Colonial architecture and later some one comes along and puts on a Queen Anne addition, and later some one comes along and puts on a Mary Ann addition. Before we change our structure let us stop and study the plan on which it was built. The men who planned our government did it in no hasty, careless fashion. They had not lived off of its bounties, but rather they had staked life and fortune and had suffered the greatest hardship in order that a just plan of government might be created.

Ingersoll said of the Declaration of Independence:

"It was the greatest document that was ever written. It opens up the paths of opportunity and fame and places the star of hope above the cradle of the poor man's babe."

We have now reached the time when some at least of our population want the government to provide them with something more than mere opportunity. Our forefathers, after studying every form of government, including all the different forms of democracy, established a republic, not a democracy. Those of us who resist many of the proposed changes in our form of government are not standpatters, but simply want changes which are in harmony and not in conflict with the government set up by our forefathers. We do not want to revolute, but are willing to evolve.

THE "RED" MENACE

You ask what we are going to do with our radical element. I don't know. First, we should split them up into the various camps to which they belong. As the matter now stands, every-

body who does not believe in the existing order of things is fighting in common with everybody else against the existing order of things. If those of us who believe it is the best we can do under the circumstances would say to all those who are against, "Well, we will step aside and agree to be governed by anything you can all agree upon," then these people would see how foolish and how conflicting many of their ideas are.

This would seem like a dangerous experiment, but it would show that unless one hundred conflicting things could be done at once there would be no chance for an agreement. If each feature of our new plan of government were decided by a vote, and those who were not satisfied could either choose to come back with us or remain with the new government, we would get back more than 90 per cent of those who thought they wanted things radically changed.

THE MASTER WORKMAN

We have preached the doctrine of the hardship of work until we almost believe in it ourselves, and yet work gives to life all that there is to make life worth while. Work of itself has furnished to mankind more happiness than any other one thing. All work is not happiness, but life with no work would be unbearable. My idea of the real aristocrat, the man who can from within his own soul look down on others, is the master workman, no matter what his line of work may be. A job well done gives pleasure to the man who does it. There is happiness in the pride of being a master workman. There is happiness in the knowledge that one can work so well as to give a greater value in the work that is performed than is represented by the wage that is received.

When I hear men exaggerate the hardships of labor and hear them describe the absence of luxuries of living as privation of living, I sometimes wonder if we are not becoming a race of mollycoddles. It seems impossible that these men can be the offspring of the brave pioneers who founded our country, labored to the limit of their strength, faced every danger and suffered privation willingly that they might live under a just government; and their idea of a just government was, when the Declaration of Independence was written, crystallized into this expression: "The right to life, liberty, and the pursuit of happiness." No, it does not seem as though the snarling, complaining ele-

ment of our population can have inherited any of the red blood of the sturdy pioneers who founded this country, but they have been bred from a puny, sickly breed of men who never could have done the labor, faced the dangers, and suffered the privations that were necessary to develop this country and set up our independent government.

Last fall we gave a welcome to our President when he returned from the peace conference. At Twenty-third Street, where the procession formed for its parade to Carnegie Hall, the President's car moved up in front of the car in which I was seated. On the running-board of the President's car, and immediately in front of the President, was a secret service man—a young man whose every movement showed confidence that he could fill his job and guard the person of the man holding the highest position within the power of the people to give. Those two men were entitled to be proud of their positions. My admiration went out, not only to the President, but to the man on the running-board. Undoubtedly he had been chosen for this job because he was a master workman. It seemed to me that the man on the running board got as much happiness from his position as did the President.

Every year, and age, and almost every day, sees some new scheme sprung that promises to give us more of this world's goods with less work. First, it is pure fiat money with nothing back of it but a printing press, then it is a minimum wage, then a single tax, then minimum hours of work, then a community form of government and equalized living conditions—; and the changes are rung and rerung, in new garb, to muddle and befog each generation.

Many men spend more time talking and pushing these things than they spend in training themselves to be good workmen—and for lack of being good workmen they never make much of a success in life. Then they see others more successful and are told by every man who wants their vote or wants to sell them a newspaper that they are the victims of a vicious form of government, and this is first their alibi and later their belief.

THE VALUE OF GOVERNMENT

But what are we going to do with our "Reds"? I don't know. A lot of them could be cured simply by poking fun at them. They want to live at somebody else's expense. They are like spoiled

children, unwilling to abide by the rules of any game. They themselves could never draw a set of rules of life or laws of a nation that they would abide by. If nobody can suggest anything better, let's set aside a nice fertile island for them and deport them to it. We will furnish them for a time with a sufficient supply of plain food to maintain them if it is properly rationed. We will also furnish them with enough plain cloth to clothe them. We will let them attend to the rationing of it themselves. We will furnish them with hand implements for agricultural work and with seeds, and then when they have had time to produce some crops we will gradually withdraw our supply of food and clothing. This is, perhaps, the only way to teach them the necessity for government and the fundamental principles of government.

A mining camp, an oil field or a construction camp, far removed from civil authority, will teach a thinking man more about the necessity for government, and the fundamental principles of government, than the best textbooks that were ever written. Give your "Reds" the territory necessary for them to set up a government to their own liking and after a few months or a few years of such an experience, if they still are alive, they will come back to us, if permitted, and be glad to subscribe to the rules of law and order and will with reverence kiss the flag.

What about our high wages? Well, it does not make much difference whether we have high wages or low wages, just so they are properly proportioned. The comforts can be just as great with low wages as with high wages, and the hardships can be just as great with high wages as with low wages. There is more danger of hardship to the wage-earning class from high wages than from low wages. High wages open our ports to foreign made goods and close the ports of other countries to the goods we make. High wages also bring about undue stimulation in the use of labor-saving machinery and tend to bring about a protracted period of unemployment.

The greatest human achievement is to have power and not misuse it. The most universal human weakness is the abuse of power. The labor unions for years had public sentiment almost universally behind them, and their power became so great that they could dictate to the President, to Congress and to their former sympathizers—and they did it. They have lost much in

public sympathy, and are in a fair way to lose it all. Wages can be forced to unjust levels by unions and strikes, but cannot be maintained there.

LABOR'S ERROR

The labor unions are now so strong that they can paralyze this country for a time, but the reaction will wreck them beyond all hope. Let us hope that wise counsel will prevail among them and they will be the first to see the need of equalizing all wages and salaries, whether union or non-union, on a merit system and not by coercion. When I say "merit" I mean the kind of employment, the drain on the worker's physical and mental resources, the time required for preparation, and all matters of that sort.

We must have lawyers, doctors, school teachers, college professors, engineers and many other workers who require a long and expensive training—and where are these men and women to come from if better pay can be had by joining a labor union and then, after a few days' instruction, have regular employment at short hours and a wage in excess of professional? Surely, even the union man wants our schools to be maintained so his own children can be taught.

CRISIS FOR UNIONS

Every crisis is supposed to produce its great men. The crisis for labor unions has come. A further abuse of their power will, in my opinion, destroy them. It is obvious that, sooner or later, merit will rule. Labor itself should propose a great national investigation of labor and a fair relative schedule should be promulgated. We will start as a basis with the housemaid and let the union men's wives fix their hours of employment and their wages, and then we will build all wages and hours of employment upon this.

What about hours of employment? Well, you could hardly expect me to be in sympathy with the short hours now proposed. I have averaged more like eighty-four hours than forty-eight hours a week. My first work was in a gas house. We all worked at least sixty hours a week. The stokers and coal wheelers worked eighty-four hours a week. I worked sixty-six hours a week. We were all a healthy, happy lot, with less dissatisfaction than you can find anywhere now.

Once when I was working as a superintendent a group of men came to me and demanded an eight-hour day. I said: "Fellows, before we discuss this matter I want to know if there is a man among you who is married and has children whose wife does not have to work more than eight hours a day. If there is, I want that man to hold up his hand and I will show you either a remarkable man or a damned liar." Not a hand went up. We talked it all over in a friendly and good natured way, and they withdrew their request. No, the truth is that as Pa's hours have gone down from ten to nine, Ma's have gone up from fifteen to sixteen, and when Pa's went to eight Ma's went to seventeen. The greatest hardships from overwork fall upon the non-wage-earning mother. As everybody else shortens his hours and increases production, the problem of clothing, feeding and caring for children becomes a heavier and a heavier burden to the mother.

NOT FOR LONG HOURS

This does not mean that I am for long hours but I am against the evident plan of some to go from eight to seven, and from seven to six, and from six to five, until work becomes a joke. There is some point of maximum efficiency for every kind of work and some point of maximum benefit to the worker's health and usefulness. Let's try and find this point.

How about production? Here is where you have hit at least two-thirds of all of our troubles. High cost of living is represented, we will say, by 5 per cent profiteering, 25 per cent increased wages and 70 per cent decreased production, due to shorter hours, incompetency and absolute sabotage. An honest and efficient day's work, without any increase in hours, would cure 70 per cent of our troubles.

The disorganization of industry due to the war means that the men now filling jobs that they are not really competent to fill must make themselves competent, and this could be done very easily in most cases if it were not for their dissatisfaction and indifference. They do not seem to realize that the lack of an honest day's work on their part is running up expenses for somebody else, while the lack of an honest and efficient day's work on the part of some other person is making their food, clothing and everything else cost them more.

I would like to see a movement started by some one with sufficient influence to do it whereby we could impress every-

body with what an honest and efficient day's work would mean in reducing the cost of living, and as this movement secured converts each of us would wear a button to show that we were pledged to do an honest day's work ourselves.

It is the dissatisfied people of this country who are punishing themselves and others.

WEALTH'S INCREASE

The first time we see an authentic statement of the increase in wealth of this country during the last few years we will all be astounded. I would not be a bit surprised to find that it had doubled.

Few workingmen have ever stopped to think that when they demand more wages and shorter hours and then see how little work they can do that they are gratuitously increasing the wealth of many of the people of the country. For instance, let us assume that Jacob Strauss is the owner of an apartment house built ten years ago, in a community where more and more apartment houses are needed. Due to higher cost of labor, shorter hours and the lower efficiency of labor we will say it now costs double as much to build a new apartment house as it cost Strauss to build his. Strauss's apartment house, of course, takes the value of what it would cost to build new—and the increased price of labor and its lower productiveness have increased the value of his house by two and have doubled the rent to the renter, but this apartment house can, in turn, be reduced from its present value by simply increasing the productiveness of labor. The renter must pay not only for the higher cost of wages and the lower production, but also for the losses and delays due to strikes.

Business becomes an art when it is carried to a high degree of efficiency. A great business success was probably never attained by chasing the dollar, but is due to pride in one's work—the pride that makes business an art.

—HENRY L. DOHERTY.

Before the American Petroleum Institute at its meeting in November, 1920, Mr. Doherty gave an address on "The Future of the Oil Business," with special reference to financing. He said:



ANY of us believe that we are passing through an unusual period in the oil business, and the problems ahead of us may be very different in many ways from the problems heretofore experienced.

I am writing this paper by assignment and request, and do not expect to develop anything of great value other than to show that the oil business as a whole will require capital on a scale heretofore unheard of, and that there is much we should do to lay the foundation so this capital can be secured and upon an advantageous basis. Also that general business conditions are inauspicious and problems that seem no more a matter of concern to the general business of the country are in reality a greater threat to the petroleum industry than to most industries on account of the huge problems which confront us. That while these matters are no more dangerous to our own corporations than to corporations engaged in other lines of work yet they are more dangerous to the general public and especially to all of those who depend upon us for a petroleum supply.

I will try to show how paralysis overtook the railroads through unwise government regulation. On account of the vast problems ahead of us, I will show why if unwise government regulation is adopted for business as a whole we would be worse handicapped to fulfill our obligations to others and the harm to the public would be vastly greater.

GASOLINE FOR FUTURE GENERATIONS

Other speakers are assigned the various subjects such as the future supply of oil, and I will not touch on this except to say that I have assumed that there will be no such thing as an exhaustion of our raw material from which the paraffin products can be produced. In other words, as I have stated to some of the representatives of the automotive industries, they will have gasoline as long as they live, their children will have it, and their children's children. If this is true, it follows that the industry as a whole does not have to be amortized, but only equipment

where local fields are exhausted and equipment that becomes obsolescent by changes in the art.

As early as 1894, I tried to convince Prof. N. W. Lord and Prof. Edward Orton, Sr., of the Ohio State University, that natural gas and oil were of inorganic origin. Since then I have concluded that the paraffin series of hydrocarbons are rather a natural and easily formed chemical compound, and that they are probably of both inorganic and organic origin. Methane, which is the smallest molecule of the paraffin series, is formed readily from hydrogen and carbon monoxide in the presence of nickel at a temperature of about 450 degrees Fahrenheit, if my memory serves me properly. At other pressures and other temperatures, and with other cataclysts, probably other or all of the members of the series would be formed. Many of the metallic carbides when brought in contact with water are reduced to metallic oxides and give off hydrocarbons, some of them yielding paraffins. These and other facts lead me to believe that natural gas and oil are more abundant than is generally believed, and will be found pretty generally the world over.

Nearly all bituminous matter will yield some paraffin hydrocarbons or their substitutes. For instance, ordinary coal will yield a considerable amount of paraffin hydro carbon when distilled at a low temperature. We also have enormous beds of shale which are doubtless scattered pretty well throughout the world, which insure an enormous supply of petroleum products whenever these beds can be economically used as a source of raw material in competition with oil which flows or is pumped from the ground.

When I speak of the ease with which nature may have formed the petroleum compounds by reciting what can be done in the laboratory, I do not want to be understood as saying or thinking that substitutes for petroleum can be made artificially and economically. Petroleum is so inexpensive when its mass of energy is considered, that the probability of finding any artificial substitute is as remote as it would be to expect to find an artificial substitute for clay which would cheapen the cost of brick making.

Just how we are to meet the continually increasing needs for petroleum I am not prepared to say, but have no doubt in my mind that an abundant supply will be had for generations

to come, for all of what might be termed the superior uses of petroleum, such as gasoline for motor cars, motor boats and flying machines, oil for lubrication and the waxes. The demand which is immediately ahead of us, I assume, will be met by the development of oil fields in the foreign countries.

GOVERNMENT CONTROL AND REGULATION.

I also assume for the purpose of this address that the business will be carried on as a non-restricted competitive business. By this I mean that, while the oil business has suffered to some extent by Government regulation and meddling, it will by no chance be subjected to Government control and regulation, such as has been justified in theory for those lines of business which are best conducted as monopolies. The tendency to subject all business activity to more or less Government regulation has been brought about largely by the advocacy of the regulation of those businesses which could best serve the public by being protected to a greater or less degree as monopolies. I cite as an example of this class the railroads of the country and the public utilities of our cities. It seemed reasonable in theory that regulation would prove highly advantageous to the public, but in reality, regulation has proven so harmful to the public that a large portion of our thinking citizens realize the danger of disaster by regulation, and this realization of the danger should bring about more intelligent regulation of those businesses which are regulated and greater freedom from regulation of those businesses which are competitive rather than monopolistic in character. This does not mean that I am against all regulation of business, or that I refer to any class of people as being against all regulation of business, but does mean that many people are convinced that unwise or overly severe regulation is worse for the public than no regulation at all.

I remember well when the campaign became active for the strict regulation of our railroads, I tried my best to point out its dangers. At that time it was a pure waste of breath to oppose the campaign against the railroads. This propaganda was a commercial asset to many newspapers that wanted to build up their circulation and to many men who felt they could make a better living if they could get their noses into the public crib, rather than support themselves on their own efforts. When the United States was laying the foundation of its greatest wealth

and prosperity, its progress was not reflected in the figures going to make up the so-called balance of trade between it and the foreign countries. In fact, there is no such thing as a balance of trade between countries stretching over any long period of years. The United States could have possibly reached even a greater position of prosperity had it gone even further with its internal development, even to the point of showing an alarming situation regarding the balance of trade with foreign countries. Railroad bonds sold to foreign investors and not counted in computation of balance of trade were about the most profitable exports we ever made. Vast sums of wealth were made available for the development of this country by the sale of corporate securities in foreign countries, which secured for us in this country internal improvements which were of vastly greater benefit to the users than the interest and dividends paid to the bondholders and stockholders.

RAILROAD REGULATION ANTAGONISTIC

These railroads were built originally on the theory that the owners would be allowed to earn whatever they could. The hope of big rewards stimulated railroad building. In my opinion the public would have been vastly better served and more cheaply served in the end if no regulation had been attempted. The regulation of the railroads was antagonistic in nature, and drastic beyond the point of common sense. The punishment to the stockholders of the railroads, and in many cases to the bondholders, was rather severe, but the punishment to the great public was terrific, and the folly of this regulation would have caused the loss of the war to the Allies if it had not been for the development of the automobile and the petroleum industries.

Reforms are generally suggested by thoughtful men, but as a rule they are carried out by fanatics who are urged on by a spirit of hate for one class of people and a desire to hurt this class rather than to benefit the class for whom the reform was originally suggested.

I have known many a newspaper and many a politician who were simply recruiting agents for the army of unrest, their principal stock in trade being to preach the doctrine of hate.

When this regulation became antagonistic and active we were a rapidly growing country with more mouths to feed and more and more bodies to clothe and shelter. Railroad building

was curtailed almost to the vanishing point. The intemperate press and the intemperate politician clamored for rate reductions for the benefit of the so-called common people, and every penny they saved to the common people by a reduction in railroad rates was paid for by the common people in the increased price of food, clothing and lumber for house building to the extent of at least ten pennies up to the time of the outbreak of the European war, and it certainly would be difficult to figure the cost of the awful punishment the public got in more ways than one by an inadequate railroad system since the outbreak of the war. With the growth of population in this country and no corresponding increase in the opening up of new lands by the building of railroads a situation would have been brought about that would have prevented us from feeding ourselves and our allies had it not been for the development of the automobile and the petroleum business.

The substitution of the internal combustion engine for animal power made available vast acreage upon which to raise food for human beings rather than to raise food for work animals. Instead of raising corn to feed the horse, we used this land to produce food for people and raised oil from below the surface to feed the engine. The pipe lines which carried the oil from the fields to the refinery and often to tidewater relieved the strain on our railroads. Picture, if you can, the situation we would have been in without this development of the oil and motor industries.

MONEY SPENT FOR OIL PRODUCTION

The public has been universally imbued with the idea that brains and capital could only be made to serve them properly and economically when subjected to Government regulation. They lost sight of the fact that the best things that have been accomplished by the combination of brains and capital have only been made possible by the possibility of huge rewards, and that human nature is such that the mere possibility of achieving the rewards is sufficient in some instances to secure greater service to the public at a lower cost than could be secured by the most intelligent regulation. For instance, an investigation will satisfy any thinking man that for several decades more money was expended for the search and production of gold than the entire value of the gold produced. The huge reward realized now and then by some fortunate individual brought more service from

brains and capital for the public benefit than any form of regulation could.

In my opinion what was true of the gold production business has now become true of the oil production business: That more money is now spent for the production of oil than the entire value of the oil produced. I have been surprised that almost every time I have made this statement someone has contradicted it on the theory that men with money to invest will certainly not put it into any venture where they know that the total losses are more than the total profits. I do not think there would be any difficulty in demonstrating that this is true simply as a matter of psychology, but there is no need to speculate on this matter when we can point to the lottery as a complete demonstration of man's reasoning, or lack of reasoning.

Everybody knows that the total amount paid into a lottery is more than the lottery in turn pays back to its ticket holders, but human nature is such that the great mass of mankind will risk a small amount of money with the hope of winning a large amount, even though he knows that the odds are greatly against him. The lottery is so alluring that it has been almost impossible to suppress it even by law in many countries, and I would not be surprised if even at this day and age lotteries on a huge scale are flourishing throughout the United States.

Those of us who have not carefully thought about the benefits that flow to the public by the widespread stimulation that comes from some sensational individual success would do well to give this matter careful consideration.

PAYMENT FOR SERVICE

Reverting for a moment to the railroads, the benefit to the public was in securing this railway service, and this they received and were getting in constantly increasing amounts up to the time the railroads were subjected to antagonistic and drastic regulation. The entire benefits received by every one who ever gained a penny of interest or a penny of profit or a penny of compensation of any kind through the building and operation of these roads were as nothing compared to the benefits received by the users. The increased value of the land adjacent to the railroads was in most cases alone more than the entire cost of the road.

The fight against business throughout the country has always been directed as a matter of the curtailment of profits rather

than the securing of good and cheap service to the public, and let us hope that the day is not far distant when Government regulation and the attention of the public will be directed for their benefit, not for the curtailment of somebody's profits.

The public do not object to paying 25 cents for a pint of spring water, perhaps twenty-five miles from the spring. Probably the spring was never drilled, its source never dries up, but is continually fed by the rains and is filtered by natural beds yielding a thoroughly marketable product. The oil man must go down two thousand or more feet into the ground, and then pump up an impure product which we will say is 15 per cent gasoline, transport it possibly for 1,500 miles, subject it to an elaborate refining process, and then is criticised for fixing a price as much as 30 cents a gallon, which would be less than three cents a pint, as against the 25-cent price for the pint of spring water.

There are two things which must govern the price of any service or commodity, and these things fix the boundaries within which the permanent price must lie. The price must be above the cost of production of commodity or rendering the service, or the service will cease. This is what might be termed the minimum sale price; but we have already seen that an industry as a whole is often willing to take part of this sale price in the form of hope, which perhaps is never realized. The upper limit, the other thing which must determine the price, and which fixes the upper boundary, is the value of the product to the ultimate user. The public, however, seldom thinks of what the value of a commodity is to them, and insist that the cost of production alone shall govern, and, as has been the case with many of our railroads and many of our public utilities today, they will refuse to pay even the bare cost for the commodity or service. The street railway situation throughout the United States is a proof of this.

We hear much talk about the high cost of living. We don't hear enough about the high cost of folly, and the treatment of our railroads is a good example of the high cost of folly; and I wonder if we are going to repeat this with our public utilities and perhaps with all other industries by Government interference and restrictions.

The foundation plan of every business must be the giving of service at less than its value to the user, and it is astonishing

sometimes to figure out the enormous benefit the user gets as against the producer, and it seems ridiculous when this comparison is made that the user should be so apt to complain. It is not so easy to make direct comparisons between oil and other substitutes. In many cases there is no substitute for oil, but I can make one illustration, which gives entirely too low a value for the benefit the user generally receives, but offers an example of how the user benefits. Of the cities and towns of the United States supplied with gas, more than 50 per cent are supplied with natural gas. This would not be possible except for the oil industry. The exploration for gas and the drilling of the gas fields is largely the result of oil operations. In the search for oil, natural gas may be found, we will say, 100 miles from some city. The city has heretofore been supplied with artificial gas at \$1 a thousand. Two feet of natural gas will do the work of more than three feet of artificial gas. Under the pre-war conditions it was not uncommon for us to raise the capital and put in pipelines to the cities and supply the customers with natural gas at 30 cents a thousand. What had heretofore cost the customer \$3, viz., three thousand cubic feet of artificial gas at \$1 a thousand, was now supplied with 2,000 cubic feet of natural gas at 30 cents a thousand, or a total cost of 60 cents; so the customer was benefited to the extent of \$2.40. The capital and the brains had to make whatever they got out of the 60 cents; in other words, instead of the 50-50 basis as an expression of fairness, natural gas came in on the basis of 80-20, the customer getting the 80 per cent benefit without risk, thought or labor. It was not long, however, until in many instances the newspapers and the politicians told the customer that he was being overcharged, and in many cases the natural gas companies today who have exhausted their fields and have to go to more distant fields and are handicapped by the increased expense of operations are denied any portion of the 80 per cent of benefit which the customer receives.

POPULAR ATTACKS ON OIL INDUSTRY

I have pointed out that the campaign against the railroad companies was a commercialized campaign to build up the circulation of newspapers and to promote the career of ambitious politicians. The same thing has been true of the oil business, perhaps even to a greater extent. I doubt if there is a man within

the reach of my voice that has not at some time or other been publicly rebuked, denied common justice, or subjected to insult by the accusation that he was trying to do something wrongful when he was not, simply because somebody wanted to capitalize for his popularity the wide prejudice which has been created against the oil business on the long continued campaign against the Standard Oil Company. All anybody has to do is charge you with representing the Standard Oil Company and then pass you your medicine.

I hold no brief for the Standard Oil Company, nor do I wish to be whipped over their back, nor am I willing to see the whole American oil industry handicapped and crucified by this worn-out wolf cry of the Standard Oil Company, based largely on exaggeration and antiquity and which to my mind was largely a commercialized campaign before we recognized that muckraking could be made a highly profitable profession.

I am an independent oil operator in all that the name implies. In the early years of the business, many another man has masqueraded under the name of independent oil operator that in plain, honest language was nothing in the world but a black-mailer. He was in business to be bought out, and never having learned the rule of honesty amongst politicians, he would not stay bought if he was bought out. We cannot judge the business ethics of one decade by the ethics of the present decade.

If prize-fighting should be made as much of an issue as business can be made, I can see some wonderful oratorical possibilities in the fact that John L. Sullivan beat down his many opponents to the point of insensibility with his bare fists, and under the influence of a great oratorical power an audience could be moved to great resentfulness against old John L. for brutality, and would forget entirely that the other fellow used his bare fists, too. John L. would be the object of anger, not because his tactics were any different, but because he won out. We have a class of people whose sympathies are always with the under dog; we have another class of citizens whose hatred can be aroused against the upper dog, or the man who makes a business success. Business has progressed in much the same way that prize-fighting has progressed. A prize-fight would be vulgar now if fought with bare fists, but business used to be fought with bare fists, and on the whole I don't know that prize-fighting

has been greatly debrutalized by the use of gloves, and I don't know that business has been greatly debrutalized by the use of gloves. It just satisfies the public a little better. When we beat up a business opponent now we smile and exchange cigars instead of swearing and pounding the table, but the net result is about the same. It is more a matter of better manners, rather than better morals.

Between blackmailers and stock jugglers and green powder men the oil business has been greatly handicapped and given to many an unpleasant odor that does not readily wear off. The men who gave this odor to the oil business in most every case were strangers to it, rank interlopers, blackmailers on one hand and gold brick men on the other. If blackmailing had paid better in the newspaper business they would have been starting up rival newspapers to be bought out. If selling gold mining stocks on salted ground would have paid better than oil stocks on barren ground, or no ground whatever, they would have been in the gold mining end of the business. The blackmailer is largely a thing of the past. The fraudulent and would-be fraudulent oil stock seller are the one thing when even in war times we never had a shortage of supply.

OIL BUSINESS HIGHLY COMPETITIVE

If the Standard Oil Company ever dreamed of a complete monopoly of the oil business, that dream must have left them a long time ago. In my opinion, the brains required to run their business could never have tarried this long with the idea of a sustained monopoly. They must have known that competition was inevitable and on a huge scale, and you don't have to go beyond the brain process to see what any set of men would do if they knew competition was inevitable. What any of us would do in this case would be to try to drive out unfair competition—competition that was unwilling to bear its just responsibilities and burdens of the industry. Later I will submit some figures from which can be deduced that the Standard Oil Company represents very little of a monopoly. I will show that the future capital requirements of the business are so huge that a monopoly is impossible.

The oil business of this country is now, and has been for a long time, a highly competitive business; in fact, too much so for the good of the public. We have got another factor to reckon

with, and that is no small one. The oil business is no longer a local business; it is international. Here is an industry that by right of discovery, development and conscientious work is largely an American industry.

The position acquired by the American oil man is now contested by the oil men of every other country. Except for a listening attitude of our government in the last few months, if our government ever reached out to give any sort of a boost to the oil business I never heard of it. Our largest and most powerful oil company, and the one that could contribute the most in maintaining American supremacy, was heaped with abuse until it was tarred with unfavorable public opinion and finally hamstrung by a court decision which largely emasculated it, while its big foreign rivals were left free to conduct themselves according to their own sweet will, and while all foreign oil companies can depend upon at least the unqualified moral support of their governments, and in many cases the unlimited support of their governments even to the extent of going down in their own pockets and furnishing them with government money to assist them, all that we can hope for is to try to keep from being hamstrung by our government until we can make them appreciate what it means to the American public and our national pride to have our American oil companies maintain their position in the world's competition for oil.

NEED FOR GREATER CAPITAL

So to those who may criticize some of the things I have pointed out as being common to every kind of business and not simply to the oil business, my answer is that we have many special problems to meet. I know of no industry today which faces the need for greater capital, and I know of no business where so little foundation has been laid for getting this capital, and in fact, where so much harm has been done in poisoning the public mind on the safety of oil investments by foolish and fraudulent enterprises almost entirely handled by rank outsiders to the business.

The matter of floating oil investment securities on the market in distinction to floating speculative oil securities was practically an unknown thing up to four or five years ago. In the early days the growth of the business was not so rapid and was largely taken care of by the reinvestment of profits. The usual vehicles of finance used by other lines of business, such as bonds, preferred

stocks and debentures, were almost unheard of in the oil business, and only in recent years have they been offered as a popular subscription to the public. Where bonds, preferred stocks or debentures were used they were largely used in lieu of purchase money.

While other lines of business have worked out not only the nature but the amount required for the various safety features required for bonds, this has all yet to be done in the oil business, except as we may here or there suit the fancy of some single banking house. The matter of drawing sinking funds for bonds on oil properties, the amount and how they shall operate, the clauses relating to maintenance of property, the provisions under which additional bonds can be issued, and all matters of that sort are questions demanding future investigation as to nature and determination as to amounts.

I will not attempt to say how these problems shall be solved, as this is not the place to do it. I will, however, touch on one or two matters of details of finance just to see if it will not stir up some interest in the whole subject.

It has taken nearly four decades for the public utility business to partially emancipate itself from some of the early mistakes in finance which had grown into customs. It is human nature to drive hard bargains. Most men learn that hard bargaining does not always pay, but few learn that hard bargaining seldom pays.

Perhaps bankers are no worse than others in driving hard bargains, but I would advise any oil man with financing to do to watch his step. When the banker reaches the same relative age in the wisdom of his profession as your son reaches in general wisdom at about seventeen years, he is pretty hard to deal with. If a carpenter owed him money he would insist on the carpenter's "hocking" his tools and would be deaf to the plea that this would lessen the carpenter's earning capacity, and therefore his ability to pay.

Don't forget this: The banker is only interested as a rule in the particular issue he is going to buy, and you have to live with the property with and through this issue and every other issue. Our greatest mistake in the public utility business was in making our issues too small in the authorized amount and not providing for a price at which the bonds could be called and paid off.

We would solemnly give a mortgage to secure a bond issue to run twenty to fifty years only to find at the end of six years that we were out of bonds and the issue had to be refunded. The mortgage often contained restrictions so drastic as to bear so heavily on the company as to jeopardize the security of the bond holder.

All bonds and preferred stocks should have provision that the company may call and retire them at some fixed price, even though this looks like a high price to the company.

Whenever possible, the sinking fund should be drawn so it can be satisfied by additions to property rather than by the use of cash to retire bonds. The old form of sinking funds compels you to take up bonds at a premium from some satisfied holder who otherwise would not sell them, and to sell other bonds at a discount to some fellow who must be convinced why he should buy them.

Property additions must often be made regardless of whether there is a bond market or not, and it is a great hardship to both make improvements without selling bonds and also to raise money for a sinking fund. The company can always give the bond holder the maximum protection if allowed to use a sinking fund which permits either the purchase of bonds for the sinking fund or the addition of property without increase in bond indebtedness. The amount of property to be added in lieu of a payment to the sinking fund is always more and often for each dollar withheld from the sinking fund it is required that two dollars be added in property.

RESTRICTIONS WRITTEN INTO A MORTGAGE

Bond dealers are very apt to ask for all sorts of restrictions on the company to be written into the mortgage. You can determine how important these are by asking the dealer how much more he would pay for the bonds if you write in these restrictions. As a rule he will not pay one point higher for a whole bushel of these restrictions.

It has become more or less the fashion for bankers to recommend the use of a preferred stock instead of a bond, and yet by restrictions make the preferred stock as drastic on the company as a bond. In fact, so far as the company is concerned they have really made the pledges that would go into a bond. This sort of a stock never sells initially for as much as would a

bond and never takes as high a value in the market as a bond would do of the same yield.

There are many people who will not buy a preferred stock, but will buy a bond, and those who will buy a preferred stock, will buy it about as readily with an outstanding bond issue as without. To use a preferred stock and pledge yourself to issue no bonds will, generally speaking, reduce the number of people from whom you might get capital.

The tendency in the public utility business is towards a mortgage unlimited as to amount or date of payment or rate of interest. Bonds can be issued indefinitely for a fixed percentage of all new property; say \$3,000 of bonds may be issued for \$4,000 of additions in property. Bonds are issued in series, but with equal priority as to assets and for such period and such interest rate as seems best at the time of the issue. As one issue becomes due, bonds under the same mortgage with a later due date may be sold for the retirement of the maturing series. The sinking fund provides that cash may be used to buy outstanding bonds or property, but if property is added, then one and one-half or twice the amount of the sinking fund payment must be expended.

Don't take what I say above about the bankers as unfriendly criticism. I have negotiated bond transactions with nearly all of the big houses, and they will recognize everything above as the same line of conversation I handed out to them to make them more reasonable. In fact, the public utilities themselves were largely to blame for their grievances due to bad financing. They were unable to show the bankers methods which gave them reasonable latitude and yet protected the bondholder. The bond dealer was forced to demand small authorized issues, heavy and badly planned sinking funds, early maturities and all kinds of restrictions. The oil business presents new difficulties in many ways, such as wasting assets on production properties and more or less indefinite costs of production and fluctuating and unknown market values for crude oil.

When I was asked to deliver this address I pleaded that other duties would make it impossible to find the time necessary to do justice to the subject, and Mr. Welch offered to prepare the statistics and dictate a written analysis of them. At this point I will introduce Mr. Welch's work verbatim, but somewhat contracted.

It is the purpose of this address in general to review what the capital demands of the petroleum industry have been; how they have been met; and to point out, in so far as it is possible, what the future tendencies of the business are likely to be. No man is competent accurately to forecast the future in any business—least of all the petroleum business; he can only point out tendencies.

Other speakers who preceded me have pointed out the fundamentals of the demand, which, broadly speaking, have increased, in terms of the number of motor vehicles demanding gasoline, from 700,000 in 1911, with a domestic crude oil supply of 220 millions of barrels, to no doubt 9,000,000 automobiles or more in the United States at the present moment, with a domestic crude oil production now running at the annual rate of 475 millions of barrels and with importations at the annual rate of about 150 millions of barrels; or in other words the country is now absorbing oil at the aggregate annual rate of 625 millions of barrels. In view of the readiness of the public to absorb this enormous quantity of oil, without a disturbance of the crude oil market in the midst of the present liquidation in many lines of business, the query therefore becomes pertinent whether there will not be in the near future an insistent public demand for oil for all purposes, which will equal one billion of barrels per annum.

I therefore turn to an analysis of what the capital requirements of the business have been, and are likely to be under the tremendous economic forces which have been at work, being primarily: an increased demand, increased production, and increased costs of labor and of capital.

Obviously the ideal method of ascertaining the past capital requirements of the oil business would be to have on a single balance sheet a record of all of the money put into the business by investors, ranging all the way from investors placing money in the most conservative and strongest of oil companies to the "lunatic fringe" of oil "investors" who have bought merely full-page advertisements of derricks spouting forth floods of oil and whose money in reality has gone merely into the pockets of unscrupulous promoters; together with an analysis of capital investments out of surplus and of actual dividends taken from the business. Unfortunately no such statistics are available.

However, it has been possible to make an analysis of the fiscal operations of 250 representative companies whose annual reports are available, and also to glance at least at the capitalization—mostly water it is true—of new oil and gas companies, not including new financing by established concerns, as per annual and monthly reports published in financial journals. The former companies can well represent the very best that can be attained in the business, and the latter perhaps the worst. Practically complete statistics are available for a group of 108 companies organized before 1912, being the so-called Standard group and the larger older “independents,” and of 142 companies organized after 1912, for which records are practically complete; and this analysis shows, as near as it is possible to ascertain from the published records, that the capital invested in the business of these 250 representative companies as of December 31, 1919, amounted to \$2,501,939,914. On December 31, 1911, those companies of the group referred to then in existence showed capital invested to \$717,098,563.

Therefore the increase in capital invested by these companies for the period from 1912 to 1919, inclusive, was \$1,784,841,351.

The cash dividends paid by all of these companies in the years from 1912 to 1919, inclusive, amounted to \$906,262,272.

Therefore the actual excess of new capital flowing into the business over dividends actually paid out of it during the period from 1912 to 1919, inclusive, was \$878,579,079.

In other words, the requirements of capital of the business from outside investors, as indicated by the operations of these companies, during the period under review were almost twice the amount of the earnings paid out as dividends during the same period.

The foregoing figures take no account of surplus reinvested in the business, but it is probably true that the reinvestment of surplus on the part of this group of companies would fall considerably below the increase in capital invested in the business by the purchasers of oil securities.

It may not be amiss also to point out that these companies during the period paid taxes aggregating \$337,737,933, or more than one-third of the amount of the dividends.

An analysis, however, of these two groups, segregating them into companies organized before 1912 and those organized after

1912, is even more illuminating than the foregoing to show how enormous have been the capital requirements of the oil industry, and how the problem of the new companies has been to get oil, i. e., increased production for the public and increased value for their stockholders, rather than to disburse dividends from a growing business.

The capital stock outstanding of the first group in 1912 was \$682,632,909, and in 1920 was \$1,341,261,560, or an increase of \$658,628,651. Of this amount, \$184,915,249 was stock dividends, and \$437,317,402 represents stock issued for cash or property, which together with outstanding bonds indicated new capital entering the business through these companies of \$537,601,799.

The dividends paid by these companies during the period was \$788,270,143, and taxes \$300,708,101.

Doubtless it was the lure of the profits in dividends and of increases in value of the stock of these great concerns which drew the enormous volume of capital used by these companies organized after 1912 into the oil business; and in this group the stock outstanding at December 31, 1919, was \$1,160,678,354, of which \$19,161,263 represented stock dividends, thus leaving a balance of \$1,141,516,731 of stock issued for cash or property, which, added to \$105,722,821 bonds issued for cash and property, indicated new capital entering the business of \$1,247,239,552.

This group of companies, constituting as a whole the strongest possible sort of competition with the group in existence before 1912, has found the capital requirements of the oil industry to be so insistent, owing to the continual expansion of the business, that it has been able to pay to its stockholders during the entire period only the sum of \$117,992,129. That this great group of companies eventually will yield a larger return to its shareholders, I have no doubt; but there are many strong independent petroleum companies, whose assets are very large, whose dividends during the entire period have been negligible because the insistent demands for capital must be met first by these companies; and sound business principles have required that every dollar that could be made should be immediately placed back in the business if the demand of the public for petroleum and its products was to be met and proper business principles were to be observed by the companies.

Although the primary purpose of this address is to bring out the present and future capital requirements of the business, it is not thought amiss to here call attention to the fact that the public—which after all is primarily interested in production—has attained its petroleum supplies under conditions in which a negligible amount of money has been taken from the business in comparison with the amount invested therein.

STOCK OUTSTANDING AND DIVIDENDS PAID

Returning, however, to the main theme—the capital necessities of the business—it will be interesting to analyze the dividends paid and the increases in capital stock by years and the results indicate a constantly increasing demand for capital.

On January 1st, 1912, capital stock out-		
standing was		\$682,632,909
The dividends paid during the year were		64,429,397
(8.43%)	and the increase in capital stock out-	
standing was		81,108,878
In 1913 the capital stock outstanding was..		885,052,410
The dividends		93,131,941
(10.52%)	and the increase in stock outstanding	
was		121,310,623
In 1914 the capital stock outstanding was....		999,921,643
The dividends		74,947,191
(7.49%)	and the increase in stock outstanding was	114,869,233
In 1915 the capital stock outstanding was..		1,057,345,913
The dividends		78,443,302
(7.41%)	and the increase in stock outstanding	
was		67,433,270
In 1916 the capital stock outstanding was		1,329,668,293
The dividends		120,568,950
(9.06%)	and the increase in stock outstanding was..	272,313,380
In 1917 the capital stock outstanding was..		1,662,307,526
The dividends		149,768,818
(9.01%)	and the increase in stock outstanding was	332,639,233
In 1918 the capital stock outstanding was..		1,794,135,393
The dividends		159,337,461
(8.88%)	and the increase in stock outstanding was	131,727,867
In 1919 the capital stock outstanding was..		2,501,939,914
The dividends		165,635,212
(6.62%)	and the increase in stock outstanding was	707,004,521

It is a point of the greatest significance that not only was the increase of the stock outstanding in 1919 equal to almost one-half of the total stock outstanding in 1917 but also that this increase, namely, \$707,000,000 in a single year, was greater than the total outstanding capital stock of all of the companies in existence and referred to in the foregoing figures on January 1st, 1912, namely \$682,632,909. So far as capital therefore is concerned, and referring to the group of companies whose statistics are being analyzed, 1919 is representative of the inpouring of capital into the business equal to the entire amount which had gone into the business from the time of the discovery of the Drake well to January, 1st, 1912.

No better illustration of the insistent capital demands of the industry can be given than that of the company which is regarded as the strongest of all the petroleum companies in the United States. In 1912 that company had outstanding stock aggregating \$98,338,382, and with the exception of the year 1913 that company has paid dividends on its common stock of 20 per cent, or \$19,667,660 per annum. In the year 1913 apparently the capital requirements of its business were so easy that it distributed a cash dividend in addition to the regular 20 per cent dividend of \$39,335,320. In the years 1912 to 1919, inclusive, these dividends, including the cash distribution referred to in 1913, aggregated \$196,676,600, and yet in the last year this great company in order to keep its place in the sun and to meet the increasing demands of the public has asked its stockholders and the public to give it \$200,000,000, or more than the dividends referred to! It has said to its stockholders:—"Please give us back the dividends which we gave you. We need them in our business!"

CAPITALIZATION OF NEW OIL COMPANIES

Coming now to the capitalization of new oil and gas companies (not including new financing by established concerns) as per annual and monthly reports published in the *Journal of Commerce*, one finds a most astonishing development. It is true that as to this group of companies it is not possible from the published figures to ascertain what the actual cash investment in capital stock is, but the figures do indicate a tendency. If one were in swampy country and found many wooden ducks floating around he would no doubt say that these wooden objects are not ducks, but if he took an accurate survey and found there were

many wooden ones he would doubtless come to the conclusion that there were many live ones in the vicinity, and the analysis of a number of new companies and their capitalization entering the petroleum business, or trying to enter it, although many of these companies may be dead and may be only painted figures nevertheless it must indicate the existence of a large number of live ones in so great a total.

In the year 1915 the statistics show 196 companies	
were organized with a capitalization of.....	\$80,533,000
In 1916—240 companies with a capitalization of....	419,000,000
In 1917—512 companies with a capitalization of.....	840,000,000
In 1918—820 companies with a capitalization of....	1,430,000,000
In 1919—(despite the shortage of paper) 1,629 com-	
panies with a capitalization of.....	3,786,000,000
And in the first ten months of 1920—1,526 compa-	
nies with a total capitalization of.....	2,421,944,000

It is of course apparent that in so much water the number of live ducks must have increased from year to year, and the rate of their increase is possibly to some extent at least indicated by the rate in the increase of the authorized capital.

FINANCING OF INCREASED COSTS

Great increases in capital have been required and will be required not only because of increasing labor and material costs and of the enlargement of plant and transportation facilities to carry on the constantly increasing quantity of oil to be handled, but also to finance the carrying of the increased value of petroleum and its products.

In no better way can this fact be illustrated, and also the further fundamental fact that the oil business, under competitive conditions, has been struck by the impact of a tremendous demand than to state the increases in the value of the crude oil produced in the United States for a period of years.

My authority for the values, 1908 to 1918, inclusive, is page 973 "Petroleum in 1918," issued in 1920 by the United States Geological Survey, and the estimates for 1919 and 1920 are based upon the weighted average value of crude oil produced in 1919, together with estimates of production for 1920.

The following is a table of the value of crude oil each year in the United States commencing in the year 1908 and ending in the year 1918, together with my estimates of the value of crude

oil produced in 1919 and produced and to be produced in 1920:

Year.	Value.
1908.....	\$129,079,184
1909.....	128,328,487
1910.....	127,899,688
1911.....	134,044,752
1912.....	164,213,247
1913.....	237,121,388
1914.....	214,125,215
1915.....	179,462,890
1916.....	330,899,868
1917.....	522,635,213
1918.....	703,943,961
1919.....	789,432,710
1920.....	1,300,000,000

According to the figures of the Geological Survey the total of all oil produced in the United States, since its discovery down to and including the year 1918, was \$4,528,867,168, so that the estimated value of the crude oil produced and to be produced in the United States in the year 1920 is equal to one-fourth of the value of all the crude produced prior to 1918. When we add to the figures for 1920 the values of oil imported from Mexico and then realize that this increased cost of the raw material must have added to it vast transportation, manufacturing and distributing costs, the financial necessities of the oil business, if the production of oil is to equal the constantly increasing demand, become such as to leave my mind in a state where I am willing only to state the concrete facts and leave deductions as to the exact future capital requirement of the oil business to others.

BUSINESS MUST BE LEFT ALONE

The one deduction which I make from the foregoing is that if the public demand for petroleum is to be met the oil business must be left absolutely free and unrestricted in its entire competitive development, financial and otherwise.

The oil business is a speculative business, and it is a growing one. Up to date each inch of profit has called for a mile of investment to insure there being an inch of profit next year. To say that a business is growing is merely to say that its capital requirements are increasing more rapidly than its dividend rates. The higher the profits the greater the necessity, not only for ex-

pansion out of surplus, but also out of new money. The higher the rate of earnings the greater is the competition created by the alluring profits, and therefore in this competition lies the protection of the public.

Any great safety so far as the public is concerned in such a situation lies in the fact that the mere capital requirements of the business themselves are so great as to constantly press down prices to the lowest level possible consistent with maximum production because every demand for new capital in a growing business is, after all, in a certain sense a great liability—a liability not showing on the books, but none the less a liability which causes the prudent business man as much concern as those liabilities which are liquidated and which are shown upon the books. The measure of a business man's ability to get new capital in a growing business is the measure of his ability to keep his place in production in that business. So likewise is the ability of the entire business to get new capital the measure of its ability to meet its public demands, and this is but another way of saying that the measure of the public ability to obtain oil for its constantly increasing needs will therefore be dependent directly upon the free and unrestricted growth of the oil business upon vast sums of capital being available to meet its imperative demands.

The competitive system will not get blood out of a turnip, but if there were any blood in a turnip it would get all of it out.

The old school of public utility people thought this was all the business that could possibly be secured. The new school knows there is a world of business that is not monopoly business. It is good will business.

—HENRY L. DOHERTY.



HENRY L. DOHERTY
Atlantic City
1921

The greatest industrial and economic problem of 1921 was the readjustment of the oil business. In spite of the fact that earnings from the oil division of Cities Service Company dropped to one-third of what they had been the previous year (most, if not all, other oil companies suffering even more severe declines), no change in dividend policy was necessary save that dividends were issued in scrip instead of cash. Fourteen months later cash dividends were resumed on the preferred and the preferred scrip taken up.

With this situation on hand it is natural to find Mr. Doherty devoting most of his time to the oil industry during this year, particularly as he was taking an active part in the creation and establishment of policies of the newly-formed American Petroleum Institute. It was his activities with the Petroleum Institute which brought him most prominently before the public and which caused him to be sought frequently for interviews on various subjects. The American Petroleum Institute was created by Mr. Doherty as the successor to the National Petroleum War Service Committee, on which Mr. Doherty had served during the war. He early realized that after-war problems would be as serious in the oil industry, though of an absolutely different nature, as were those of coordinating the various activities during the conduct of hostilities. Among those who interviewed Mr. Doherty was Herman J. Stitch, special writer for the Pittsburg Dispatch, who wrote the following for his paper:



ENRY L. DOHERTY, for the past few months the most talked of man in New York, never had a chance in life.

He was born 50 years ago in Columbus, O., at which time that now thriving little city was nothing more than a whistling point for hurrying locomotives.

His parents were plain folks who took whatever Providence sent and counted it gain. They shared the little they had with

those who needed it more and then practiced extreme thrift, but not because it was a fad.

Young Henry was 12 years old when his father, always more visionary than practical, died, whipped out and discouraged, leaving a widow and four children unprovided for.

The little lad sold newspapers, tended furnaces, ran errands, delivered groceries, worked on an ice wagon, put in some time in a rolling mill, pottered around a printing plant and finally wound up as handy man in the local gas works.

The average boy thinks it a hardship if he has to work more than eight hours a day and the child is father of the man. Henry was on the job 11, 12, 14 hours out of the 24 and attracted immediate notice because he had no competition.

About this time it dawned upon Doherty that he was an awful ignoramus. He had always hated study. School to him had been a nightmare. He was quite a normal youngster. Also he hated poverty. And being sensible, it did not take him long to figure out that the two hates did not go together, that the man who knows least wants most, that training is preparedness, knowledge is capital and learning is the first step to earning and independence.

Doherty began to study, to study and to save. He studied, saved, grew, became and climbed until today the whirligig of time finds over 100 Doherty public utility undertakings flourishing throughout the United States, and his oil enterprises rivaling John D.'s companies in the production of petroleum.

Thrift is Mr. Doherty's hobby, pastime, passion, almost religion. He has experienced poverty, seen the depredations of thriftlessness, and he is their mortal enemy. He has spent thousands of dollars in his last thrift campaigns, and he intends to spend thousands more to popularize prudent investing on the part of the wage earner. This way, he says, lies the salvation of America and its people.

The average wealth of over half of our people is less than \$60 a piece—not a very great amount. The ordinary individual not only has nothing put away for his old age, but he has nothing put away for week after next. He is constantly treading the brink of a precipice and it needs but a slight adverse breeze to send him reeling over.

We are going along on a extravagant plane of living. Little by little we even get to living above our incomes and so live below our ideals.

To be able to save means ability to control yourself, and if you don't control yourself you won't get much chance to control others.

The man who does not save inevitably suffers.

"Every time we have a business depression," declares Mr. Doherty, "you can take cities where the wages have been the highest and within a week of the day work actually stops and factories have shut down you have a great mass of people who are absolutely dependent on charity. The explanation of course, is that thrift is not only not universal in this country, but it is really rare. You don't realize how rare it is. And if we are going to have such periods of depression there is only one way in which people can tide themselves over without terrible suffering and hardship, and that is by saving at a time when they are earning.

"Thrift is a panacea for more of our ills than any other one thing. If you can point to any problem that this country faces, I do not care what that problem is, you will figure out that if we get the majority of our people to save their money and invest it in the business corporation securities of our country that it would completely solve it or simplify it. If we went to work and put the effort into thrift campaigns that we put into charity campaigns, charity campaigns would be unnecessary. And how much easier it would be to persuade people to put money into their own pockets than to get them to take it out of their pocket and put it into the pocket of some other fellow.

"If you want something to think about," said Mr. Doherty, whimsically, "think what it would mean to this country to have its millions of wage earners throughout the land save and regularly invest part of their wages in the business enterprises of which they are a part. Think what it would mean to industry, to the country and to the man himself. You immediately get a better grade of citizen, a more industrious worker, a man more reasonable in his social and political views, less ready to become excited by the revolutionary talk of malcontents who never having worked and saved industriously, have nothing to lose."

Do you expect to give charity—or to take it? Do you belong to the “haves or the have nots?” Resolve right now to bestir yourself and become one of the “haves.” Your money, carefully invested, will do an incalculable lot to make you happy, healthy, wealthy and wise.

Get the Doherty idea—no day without a bit put by.

It's a good idea, good for you and yours, good for Uucle Sam, good for the chills and blasts of misfortune of 60.

There are lots of failures because people insist on studying mankind second hand. They study mankind from an author of fiction who also had a second-hand education.

—HENRY L. DOHERTY.

For another interview, participated in by a number of newspaper men and technical editors, Mr Doherty prepared a statement on “Suggestions for Stabilizing the Oil Industry,” which was as follows:



SEVERAL years ago I was called upon to take charge of a new corporation. The secretary of the corporation was its credit man, and he was particularly proud of the record he had made regarding bad debts, claiming that this corporation had lost less through bad debts than any other similar corporation in the United States. He brought this to my attention when he was first introduced to me, and repeatedly called my attention to it in the first one or two days in which I was getting settled. On the second or third morning he brought me in a comparative statement to show what a record this corporation had made. By this time I realized he was a highly conceited man who was riding a hobby, and I was getting pretty tired of hearing about it. I looked at the statement and said: “I am very sorry, Mr. Blank, but you have caused this company such heavy losses that I will have to ask you for your resignation.” He thought I was joking at first, but I soon convinced him that I was not joking, but in dead earnest. I told him that while the books would show what had been lost through

bad debts, there was no way of knowing what the losses had been by ill will engendered and by having driven away highly profitable business; but I told him I knew these losses must have been immense because his bad debt losses had been so small. There are some losses in business that books cannot show, and, as a rule, they are great big serious losses.

The loss to the oil business, due to instability of price and instability of supply, has unquestionably been stupendous.

Before I entered the oil business I was engaged almost exclusively in the public utility business—and I always worked on a large cost differential against the use of oil. In other words, I always preferred, if possible, to make coal gas rather than water gas, even though my costs were considerably higher. In making water gas I was compelled to use oil, and I preferred the higher cost of coal gas rather than the fluctuating costs of water gas. As a public utility must sell at a fixed price, fluctuations in cost for raw materials endanger the earning power to a greater degree than to base your selling price on higher costs of material initially and avoid fluctuations.

Many manufacturers will use an inferior fuel in preference to oil rather than submit to the caprices of price and supply experienced in using oil. A great deal of the ill will toward the oil companies is due to the fluctuations in price.

In the early days of the electric business electric service was often sold at a flat rate per month. This arbitrarily fixed price in ninety-nine cases out of a hundred was either far too much or far too little. Nevertheless, those who paid too much never complained, because their bills were uniform and they knew what they were going to be. When sales by meter measurements were adopted the fluctuations in the amount of the bill caused people to complain, although in many cases their bills under the meter method were far less than they had been under the flat rate method.

There has never been sufficient justification for the wild fluctuations of price that have occurred in the oil business—and there has been no particular effort made to avoid these fluctuations.

If we had had nothing but the American fields to deal with, the matter would have largely righted itself. In the early days of the oil business the discovery of every new pool brought in such

a large additional supply of oil in relation to the consumption and available storage then existing as to seriously flood the markets. The country, however, has been raked over and the tendency always is toward the discovery of smaller and smaller pools, while consumption has grown to such a great extent that a new pool is less and less of a disturbing factor.

We have been an oil importing country now for some time, and diligent development work is being carried on in many of the foreign countries. Possibly these foreign pools will be so large in comparison with even our existing markets that we have not yet reached the point of stabilization due to the operation of relationship between consumption and the shock of increased production from newly discovered pools.

The markets which are now supplied by the Mexican crude oil are the markets which would otherwise be supplied with American oil, so far as price would permit. The easiest way to think of our production now is to combine the production of the United States and Mexico and treat it as a unit. In 1910 the production of these two countries was scarcely more than 500,000 barrels per day—and it is easy to see how a field like Cushing, which was quickly developed to a production reaching as much as 326,000 barrels a day, could not only choke up with great rapidity all available storage, but completely demoralize the oil market by an over supply of crude. In 1921 the production of oil in the United States and Mexico was approximately 1,600,000 barrels per day, and the discovery of a new American pool even of abnormal size need not seriously depress the market for crude. In watching the Mexican pools, however, we have had a new demonstration not only as to the quantity of oil which can be produced but also the rapidity with which this oil can be produced.

The history of the oil business has always been one which has fluctuated continually between flood and famine, swinging back and forth irregularly. There is little, if any, appreciation on the part of the oil men themselves of what immense benefit would accrue by a greater stabilization.

The business has been developed along lines which makes it perhaps the most highly competitive business of any in existence. This has been accentuated by laws intended to prevent restraint of trade to the detriment of the public, and yet these laws, and

the court decisions based on these laws, have really prevented proper and necessary cooperation of the people engaged in the business to enable them to conserve oil for the benefit of the public.

The amount of oil stored above ground is always ridiculously small. It has seldom been more than the equivalent of a six months' supply, and has often been as low as a ninety day supply—and were we to make proper allowance for unmarketable oil in tank bottoms, necessary stocks for refinery operations and oil to fill our various pipe lines and other obviously unavailable oil, we would probably find that we have repeatedly been far below even a sixty day supply.

There is perhaps no other commodity where the customer carries so little of his needs in stock as of oil. If the customer carried as liberal stocks of oil as he carries of steel, coal or other raw materials, this alone would go a long way toward stabilizing the oil markets.

There are many things which discourage the storage of oil, not only on the part of the user, but on the part of everybody clear back to the producer.

First—We have never developed methods for storing which are either efficient or economical.

Second—Faulty storage construction, coupled with the natural tendency of lawmakers to be meddlesome and unnecessarily severe, has caused the passage of many laws and regulations making the storage of oil exceedingly difficult.

Third—The insurance rules are drastic—and it is doubtful whether either the public engineers or the insurance engineers would have sufficient courage to modify these regulations, even though safe and economical storage plans could be devised.

Fourth—The evaporation losses in storing light products, or mixed oil containing some light products, have been exceedingly large.

Fifth—The capital involved for the storage of a large amount of oil runs into staggering figures; and this, coupled with the fact that neither the oil men nor the bankers have as yet devised recognized methods for financing oil operations, makes the supply of capital difficult—although no other line of business has such a huge basis for credit as has the oil business, many of our most powerful companies having no bonded debt whatever and quick assets many times greater than quick liabilities.

Aside from public regulation of the drilling and production of oil—and which I am not as yet ready to advocate—the greatest step for stabilization would be:

First—Efficient and economical means for storage.

Second—Revision of unnecessary restrictive laws, regulations and rules by both the public authorities and insurance companies.

Third—Salesmanship of fuel oil on a broad scale—which would have to include educational work to show the consumer where he can use oil to the greatest advantage in place of other fuels and to demonstrate how great its value is.

Fourth—Creation of the means and instruments of credit whereby funds can be raised in large amounts whenever it is necessary to store oil on a huge scale.

Our present methods of tanking are unquestionably unsafe. Tanks are repeatedly fired by lightning—and yet whoever heard of a gas holder, of which there are thousands scattered over the United States, being struck and fired by lightning? If anybody will show me where a gas holder has ever been struck and fired by lightning I will undertake to convince him that it was a mistake and that such a thing is impossible.

The gas within a holder is just as easily ignited as the oil vapors on top of an oil tank, and the only distinction is, first, that the gas holder is generally gas tight, and, second, that if there is any leakage whatever it is a leakage of gas to the air rather than a leakage of air into the gas holder.

The gas holder is connected with a system of underground mains more extensive than the oil tank, and more certain to reach a water bearing strata, insuring a good ground; but the oil tank can be constructed practically bottle tight, can be maintained under pressure so that any leakage will be of gas or oil vapors out instead of air in, and there is no trouble about grounding the tank down to a permanent water bearing strata. Avoid the mixture of air and oil vapors in the top of your tank and it is impossible to fire it. Properly ground your tank and it will be impossible for lightning to tear or wreck the tank.

Evaporation from our present oil tanks carries off the light and the most valuable portion of the gasoline, and the presence of dry gases above the oil causes this gasoline to evaporate at a much lower temperature than would be the case if the oil had superimposed upon it the saturated vapor of these gasolines. We know how a dish of water evaporates in an open pan due to sweeping away the superimposed vapors by the dry gases, and we have a condition approaching this in our leaky top oil tanks.

The standard 55,000 barrel tank is 114 feet in diameter, and it is customary to set these tanks with a 500 foot distance between their peripheries. This means that we are storing oil only equivalent to a depth of 9 inches if the entire ground surface was used.

Even our present method of tank building is too expensive from the standpoint of cost of tanks and cost of land for the storage of fuel oil—and there is practically no loss in the storage of fuel oil, as it contains none of the lighter products.

In my opinion, there has never been a time when, with proper salesmanship, all of the fuel oil could not have been used at a price at least double the low prices which have been touched. Generally speaking, I think that fuel oil could, with proper salesmanship (which must include the education of the fuel user), always command at the refinery a price double as much per million B. t. u. as coal could be purchased for. Under present conditions, however, whenever we have a flood of oil we find ourselves cutting the price of fuel oil below the price of coal on a B. t. u. basis.

There are many uses for fuel oil which I will refer to as superior uses. By this I mean places where fuel oil has such an advantage that the user can afford to pay vastly more for it.

Generally speaking, no fuel oil ought ever to be burned under boilers except at sea, because there are so many other places where it could be used to so much greater advantage. I have never tried to compute the value of oil for ship propulsion, and possibly its value may vary as one is to two on different character of ships and for different voyages. However, the increased room made available for cargo space, the greater steaming radius, the greater ease with which fuel can be taken aboard ship, the getting rid of the most undesirable class of labor on the ship, together with reducing the size of the crew, and the possible reduction of time of the vessel in the harbor, would give fuel oil an enormous advantage over coal.

Some of these advantages could only be realized with a reform in the matter of ocean transportation, for there are a great many things done in shipping which are hard for an engineer educated in other lines of work to understand. For instance, to a man who has watched both lake shipping and ocean shipping it is impossible for him to believe that an ocean liner must re-

main in port as long as it does in contrast with what is done on our lake boats—and I look to see the time come when the lake methods will be adopted by the ocean transportation companies or else a time when the lake shippers will be in charge of ocean transportation.

Internal combustion engines with the reliability of steam engines are easily possible, and the oil companies could well afford to take the necessary steps to stimulate their production to meet this demand.

Most high temperature processes can be rendered much more economical by the substitution of oil in place of coal or in place of producer gas. I do not care to unnecessarily consume the time of this meeting, but I am prepared to show that in many cases 60 B. t. u. of high temperature oil combustion will do as much work as 100 B. t. u. of producer gas combustion. If you are working with a high temperature process requiring, say, 2,000 degrees it makes a world of difference whether you are using a fuel that will only give you 200 degrees temperature in excess of that needed for your process or whether you can run your temperature to the limit of your refractories and have available 600, 700 or 800 degrees differential to put the heat where you want it.

Many processes depend very largely on the luminosity of the flame, the heat being carried to the material in the form of radiant energy. This is true of many of our metallurgical processes and also the clinkering of cements. Producer gas, on account of its low flame temperature and low luminosity, has never proved satisfactory or economical for cement burning, so far as I know, and it is customary to use powdered coal. It is expensive to powder coal. Powdered coal is more dangerous than oil, and it can be shown that more disasters have occurred in relation to the extent of its use than have occurred in relation to the extent of the use of oil. Powdered coal also carries practically all of its ash into the air, greatly to the detriment of any community in which it is used.

Many metallurgical furnaces would not only do a vastly greater amount of work for the same number of B. t. u. used, but the furnaces would be greatly increased in capacity and with a much lesser labor cost.

I have not attempted to prepare this paper until the last minute, and cannot search for data, but, in my opinion, open

hearth steel furnaces could use oil with great economy per million B. t. u., and in addition thereto the capacity of these furnaces would be tremendously increased.

The subject that has been assigned to me is not one that can be disposed of in a single paper, but should be made a matter of continuous consideration. Stabilizing the oil business really means conserving oil, and is a most important factor in our conservation program. A flood of oil now always means an enormous and unnecessary waste.

In business life there is no such thing as hitting the bull's-eye every time.

—HENRY L. DOHERTY.

Henry L. Doherty & Company, early in 1921, published in the newspapers of the metropolitan district of New York some most interesting advertisements under the general title of "An Investment Message." These advertisements were published for the purpose of arousing the people to the knowledge that never before in the history of finance had there been such investment opportunities. Speculative securities were not considered in these advertisements, but only strictly investment securities which were selling at the lowest market prices, meaning, of course, the highest income yields, in the history of investment in this country.

The Advertisements feature the following messages:



PERHAPS never again will there be such bargains in investment securities as the market now offers and so we say to all — and this means you— scrape together all the money you can get without borrowing and buy investment securities— and buy them now.

We have had a long period of abnormally high interest rates. We used to issue 5 per cent bonds and sell them at par. Many of the bonds being issued now bear an 8 per cent rate. Nobody is going to buy a 5 per cent bond at par if they can get an equally safe 8 per cent bond at par. Many investors are taking the bonds

out of their safe deposit vaults that they had carefully selected over a term of years and are selling them for whatever they will bring and are putting the proceeds into tax exempt securities. The investor who comes in the highest surtax bracket of the Federal Income Tax must pay to the government 73 per cent of his income. He gets \$50.00 interest per year on his bond and the government takes \$36.50 of it, leaving him with \$13.50. Now, if he buys a municipal bond which is tax exempt he gets and keeps his full \$50.00. Stated in another way, he can get as much income from a \$1,000.00 tax exempt bond as he would get from \$3,700.00 invested in corporation bonds.

The above is only one of the many reasons why we say that perhaps never again will we see such investment bargains.

Now as to safety. The public sees a bond selling at, say 70 per cent of its face or par value and says, "Why, it cannot be safe." Many of these bonds are not only safe but safer than when some big capitalist after careful investigation bought them at par and carried them with pride and satisfaction to his safe deposit vault. We have shown in the above example how, if he had sold \$3,700.00 of these bonds for \$1,000.00 and bought tax exempt bonds his income would be no less. In other words, if income alone were to be considered he could sell his corporate bonds at 27 per cent of their face value and have just as much income.

Now let us assume, simply for illustration that one block of bonds was issued on a hydroelectric power plant built before the outbreak of the war. We will assume the plant was originally bonded for 50 per cent of its cost and all of the bonds are still outstanding. This same plant could not now be constructed for double its original cost, so these bonds only represent 25 per cent of the reproduction cost of the property. As the bonds can now be bought for 70 per cent of their face value it means that the purchase price paid now for the bonds is only 17.5 per cent of the reproduction value. The above is only an example of one type of many safe investment bargains.

We urge investors to make discrimination in purchases. While some securities have become more safe, it goes without saying that some securities have become less safe. That is why we are urging all of those who do not have a professional knowledge of investment securities either to be guided by our advice or to

rely upon one of the many thoroughly reliable houses that deal in investment securities.

Generally speaking, we also advise sticking strictly to investment securities rather than to speculative securities. It is possible to secure a handsome income yield and the assurance of a profit without going beyond high class bonds and preferred stocks. Prices have been carried to unprecedented low levels by the forced sales of stocks held by those who have purchased on margins and are unable to supply additional margins in a falling market. There will be a partial recovery in market price as soon as this forced selling is over—and we think the most of it will be cleared up not later than the first week in January. Very few true investment securities are carried in these margined accounts and yet their market value is influenced by these forced sales. As interest rate becomes normal the value of securities will go back to their old levels.

We do not promise that there will be a full recovery in three months, or even in three years, but it is bound to occur sooner or later, for we are bound to have normal interest rates again. The longer securities prices are low the longer will be your opportunity to accumulate more funds and invest them advantageously. Even with investments limited to strictly high grade bonds and preferred stocks we believe it is possible, in addition to getting a handsome income, also to realize a profit of 25 per cent or more.

First of all we must recognize that we are giving a service and not simply selling a commodity; that equity of charging is more important than simplicity of charging, and methods of charging which can only be justified on the grounds of simplicity can be economically so unsound as to at least seriously handicap the business, if not ruin it.

—HENRY L. DOHERTY.

Henry L. Doherty, through the New York papers issued an investment message, of which the following is a part:



THE financial pages of our papers devote most of their space to speculative securities—and for a good reason. Investment securities furnish little news. In normal times fluctuations in market value are small. A true investment security is not one on which you have to stand over a stock ticker and watch quotations; nor do you have to watch the daily reports on the financial pages of your newspaper. A true investment security is one you can lock up and forget until some day when it is convenient for you to sit down and discuss with your investment adviser whether there has been any change in general or specific conditions which would make a shifting of your investment advisable.

Now, on the other hand, the more speculative a certain security may be the more news it is apt to furnish. Newspaper headlines have bristled with news since we started this campaign of the rapid advance in this or that security—all of them, of course, speculative in character. This apparently has given many people a notion that they have already lost their chance to get bargains. Such is not the case. None of the true investment securities have advanced in market value to where they are no longer bargains. Some may have moved up, however, to where they are no longer the best bargains. Some of them have hardly moved up at all. There are still plenty of bargains to be had. Don't let newspaper reports relating only to speculative securities shape your investment thought. The spectacular advancing market we have been experiencing in speculative securities is simply a rebound from a long continued declining market. It is characterized by an irregularity and unevenness which might almost be termed disorderly—and this because in these speculative securities the battle is largely a struggle among professionals.

It will be strange indeed if the upward tendency of the present speculative market is not characterized by bear raids, and here and there by marked reactions in prices. As many people have got the idea that they have lost the opportunity to buy investment securities at bargain prices because of the rise in prices of speculative securities, we therefore fear that

when a reaction in prices is reported for the speculative securities it will make them nervous about buying investment securities.

Our advice is to "buy—and buy now." A reaction in the market for speculative securities should have little or no effect on the true investment securities. However, if the reaction in the speculative market should be so heavy as to depress quotations on investment securities, our message would be to those who have not bought, as well as to those who may have bought, "buy—and buy then." While we expect reactions in the speculative market, we think it would be taking an unwarranted long chance to expect to get your true investment bargains at less than you can buy them for today. Our advice has been, and still is, to "buy—and buy now." We are sorry if you did not act on our messages published heretofore, for if you did not you have already missed some bargains, but there are many bargains still to be had practically as good as those you may have missed.

Never let the other fellow get you angry, as when he does he has you at a disadvantage.

—HENRY L. DOHERTY.

Mr. Doherty's unceasing admonitions for the people to save money and invest it where it would work for the owner resulted in his being invited to address a joint meeting of the Advertising Club and Rotary Club of Hartford, Connecticut, early in 1921. No record was made of the address, and the following abstract is taken from a newspaper report:



THRIFT is instinctive in men and animals, and there would be more thrift among the people if they were not surrounded with temptations to spend money. Something should be done to balance this temptation in order that the average person would have at least an even chance to be thrifty.

"Saving, when first begun as a practice, soon becomes a fixed habit. This is one of the reasons for the accumulation of great wealth. Engineers will understand what this means when it is said that thrift is 'self-exciting.' Even if the habit becomes a

mania, that man, even though he may overdo it, is more valuable to a community than the spendthrift. For one produces more than he consumes, while the other is vice versa.

"We ought to try to make more, if not all, people thrifty, and it is equally important to persuade greater numbers of people to become investors in public utility securities. The average voter may be depended upon to secure sanity in legislation. But what he needs to understand is that the utility corporation is not so much an octopus as it is more truly a small man's partnership, and that it is the only way by which men of small means can combine their capital in an industrial undertaking. We must encourage more people actually to become part of the business world.

"I hope to see the thrift movement become a national campaign. While it is true that many people have lessened incomes compared with a year ago, the rewards, nevertheless, of saving are greater now than they have ever been. This is because investment securities are almost at the lowest point they have ever sold at for a generation.

"It is well enough to encourage people to open savings bank accounts and to encourage them to buy homes, but these things go only part way. We can never hope to have business get a fair hearing in the public mind until greater numbers of the public have actually entered business by acquiring securities of business corporations.

Mr. Doherty also emphasized the fact that through a real thrift movement we can cure most of the ills and solve most of the problems of which the country complains. The need for charity can be eliminated by thrift, he declared. The needs of industry for new capital can easily be furnished by wage earners, through thrift on their part. Business as a whole will thrive when it gets a square deal, and it will get one only when more men are financially interested in business."

Tell the young man just starting to shun the man who is always talking against his fellow employee, for he will not only not get anywhere himself but may hold back those who are willing to listen to him.

—HENRY L. DOHERTY.

In an interview on thrift and the benefits of investment, Mr. Doherty said:



ABOUT eight years ago I took a group of factory workers, experimented with them, and found that it was not at all hard to get them to save and invest their money," states Henry L. Doherty, employer of 20,000 people.

"This experience confirmed me in an idea I had formed that people of all classes throughout the country could be educated to the advantages of becoming investors in high-grade corporate securities. The war prevented me from undertaking a nation-wide campaign to induce workers, salaried people, and others to become buyers of good stocks and bonds.

"Now, however, I feel convinced that the time is opportune for arousing interest and securing action. I don't say—no man can say—that we have positively reached bottom in the security market; but we are at a point where I am willing to take the responsibility of urging the public to buy gilt-edged securities. Those who buy the right kind of securities now don't need to worry if quotations go lower. They can buy now in the knowledge that they are getting a dollar's worth for fifty cents or seventy-five cents.

"Employers are at least partly responsible for the failure of the great body of American people to become small investors, as in France. If an employer's cook or chauffeur or other employe came to him and asked what he or she ought to do with savings, the employer, rather than accept the responsibility of giving advice, would reply: 'Oh, put it in the savings bank,' or, 'Buy Government bonds.' But he himself would not dream of being satisfied with the 3 per cent formerly paid by savings banks or the very small income yielded by Government bonds.

"I realize that it is a great responsibility for an employer to recommend investments to his people. But conditions are now such that I am entirely willing to take that responsibility."

One crucial test of a man's business ability is whether he can live well within his income.

—HENRY L. DOHERTY.

In February, 1921, New York was visited by one of the heaviest snowstorms in its history. Traffic was tied up completely, and it took days to dig the city out, so that business could be conducted on a normal basis. The ineffectual efforts of city employes got Mr. Doherty's goat, and he set about to devise something constructive. The following correspondence resulted:

HENRY L. DOHERTY TO CALVIN RICE, SECRETARY OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, NEW YORK.



DEAR Mr. Rice: This is Washington's Birthday, and I stayed home with the idea that I would have a fine, quiet day to catch up on a lot of work; but I could not resist looking out the window from time to time at stalled wagons and stalled motor cars, and the irregular and spasmodic exhaust of one particular automotive engine that was doing its best as one of the new caterpillar snow scrapers.

I saw snow that had been heaped on one pile by a workman shoveled off of that pile onto another pile. I saw one workman carefully clean out a gutter and then another workman came along and scrape the newly fallen snow off the sidewalk into the gutter that had just been cleaned. I saw a group of firemen wasting tons of water to flush snow, that was piled up and out of the way, into sewers—and I wonder how many members of our society there are other than myself who suffer a nerve strain every time we have a snowstorm in watching how the problem is met, or, rather, how it is not met.

While last Sunday's snowstorm was handled better and more promptly than any for a long time past, nevertheless, it leaves much to be desired. The expense for handling snow by any method that has yet been used is appalling.

May I suggest that a special meeting be called at an early date of the members of the society living in the metropolitan district to discuss plans for handling the snow on our city streets. Nobody seems to have made a very careful analysis of what the problem is or how to solve it.

I suggest the formation of a volunteer organization of our members to plan and supervise this work until it has been solved and systematized. We have among our members many who have worked on all sorts of engineering planning, those who

have supervised the making of organizations of workmen, and much inventive genius.

While I know that the last thing an engineer should do is to offer suggestions on the spur of impulse, nevertheless, I am going to be foolish enough to do this just for the sake of giving my fellow members something to shoot at.

I will assume that, with the least possible cost, we want to handle the snow so it will impede traffic to the least possible degree and for the shortest possible period of time. Therefore, our problem is: To clear such foot, road and drainage paths as may be necessary to accommodate traffic, and to place the snow taken from these paths where it will impede traffic the least.

Now, it seems to me the biggest mistake we make is to do no planning as to where this snow should be placed to give the least impediment to foot and vehicle traffic; also to do no planning as to drainage. Before this snow is off our streets perhaps a million people will, even if wearing high rubbers, find that they have stepped into slush and water and filled their shoes with water. How much sickness this will cause I do not know.

On account of the lack of uniformity of New York City streets, and because of the variation in width of sidewalks in relation to the width of roadways, no general rule can be laid down. A survey of every foot of our streets is required to locate all of the spaces, niches and excess roadway or sidewalk widths which may be used for, we will say, "parking" this snow. Many of our streets have wide sidewalks and narrow roadways, and it seems to me obvious that it is a mistake on such streets to entirely clear the sidewalk and shovel all of the snow into the roadway.

Maps should be made of every foot of our streets, showing just what foot and vehicle paths are necessary and therefore should be cleared of snow, and these maps should show where the snow should be piled that is taken from the paths that are cleared.

Generally speaking, it seems to me that the foot paths should be made at the curb side of the sidewalk, and the width should depend upon the amount of foot traffic. In most cases, the snow taken from this path should be thrown back on the building side of the sidewalk rather than be shoveled into the roadway.

On the one-way streets, one gutter should be cleared for a space of, say, one foot for the purpose of drainage. On the other side of the roadway a path should be cleared just wide enough for one vehicle, with here and there a widening of this path to permit another vehicle to stop for loading or unloading purposes.

On the two-way streets, a cleared path should be made on the curb side of the walk and a width only sufficient to take care of the foot traffic. Two road paths should be cleared on either side of the street along the curb just wide enough for one vehicle, with parking spaces cleared out here and there in the center of the street, no cars being allowed to stop in the roadway next to the curb.

All of the above is given only as a first aid and until the snow can be hauled away or otherwise taken care of, the idea being to do no more work at first than is absolutely necessary, and in this way re-establish traffic at the least expense and in the shortest possible time and then to proceed upon the problem of the final disposal of the snow.

I do not know how much it costs to haul this snow away and dump it in the rivers, nor do I know how much it costs to flush this snow into the sewers with water. I am inclined to think that the flushing, if the true cost were known, would show a very much larger expense than hauling this snow away bodily. I also believe that the cost of hauling, except in cases where the haul is very short and where it might be done with some sort of a scraper arrangement, will be at least twice as great as it would be to briquet this snow and pile it up at the least inconvenient space on the streets and let it stay there until it melts.

I telephoned over to the Weather Bureau to learn something about the density of snow. The man at the other end of the telephone said that they generally figured snow as having a density one-tenth that of water. Kent gives the density of snow at from 5 to 12 pounds per cubic feet, and Kempe gives the density at from 5 to 11 pounds per cubic foot. The higher range of weights for snow as given by Kent and Kempe probably refer to other than freshly fallen snow.

Numerous patents have been filed for the making of ice and artificial snow by subjecting water to exceedingly low pressures or by bubbling air through it that has been previously expanded

in a cylinder doing work or otherwise chilled. The snow or slush thus produced is pressed into a cake of opaque ice, and, if I remember correctly, this ice has a density of something in excess of 50 pounds per cubic foot.

Snow, except when very dry and cold, can be easily pressed into a briquet, and where very dry and very cold needs only a slight addition of water to bring it up to the freezing temperature and put it in form to be easily briquetted. Assume a specific heat of .5 for snow and a latent heat of crystallization for water of 141 B. t. u. per pound, then if the snow is at a less temperature than 32 degrees Fahrenheit it will require but about seven pounds of water for every ton of snow for each degree below 32 degrees to bring it to a temperature of 32 degrees. I mention this only to show that by the addition of a small amount of water we could design our briquetting machine to work under constant conditions.

Accepting the figures of the Weather Bureau as to the density of snow, and assuming it can be pressed into a briquet having a density of 50 pounds per cubic foot, you can put your snowfall into one-eighth, or $12\frac{1}{2}$ per cent, of its original volume.

I am inclined to think that something in the nature of a briquet-making machine producing a briquet, say, 9 x 9 x 18 inches, would be one very satisfactory form. Such a briquet would weigh approximately 40 pounds. If these briquets were laid up in a wall in the middle of the street, and to a height of 3 feet, you would be able to take care of more than a 12-inch snowfall on a 60-foot street with a wall of snow of 3 feet high and 3 feet wide. Considered in another way, 3 feet of your roadway, or 5 per cent or one-twentieth part of your street width, would accommodate more than a 12-inch snowfall.

The Weather Bureau told me over the telephone that the heaviest snowfall on record for an entire season was less than 78 inches, while in some seasons it has been as low as 3 inches. Of course, you would never have to store a full season's snowfall, but it is interesting to note that a 78-inch snowfall could be put into briquets and would make a wall 6 feet high and 8 feet wide, taking up $13\frac{1}{3}$ per cent of the width of the street.

In fact, the space required for our snowfalls is so small if it is put into a form permitting it to be laid up in piles having perpendicular sides that there is no need to strive for a great

density. The actual power required to compress the snow to a density giving it merely the strength of building blocks would probably be almost negligible. Briquets can be made by forcing a taper rod through a mould filled with briquetting material. This form of briquet would occupy more bulk, but would melt more easily. However, the walls of briquets could soon be disposed of by breaking a portion of them up and scattering them over the street on every succeeding warm day after the snow-storm.

Dust and dirt are very effective in the quick elimination of snow. It is a very common argument to hear that our seasons must be changing, because localities that used to have snow all winter long, and where everything went on runners instead of wheels, now find that their snow is soon melted. I think the explanation of this is entirely due to more dust and dirt. White snow is almost a perfect reflector and reflects rather than absorbs the radiant energy of the sun, while dirt, and especially coal soot, transforms the radiant energy of the sun into sensible heat. Even when the temperature is far below the freezing point bright sunlight readily melts snow which is covered with dust or soot. This offers another angle for the inventive mind.

I predict that the upkeep on the caterpillar scrapers will be very high, and that many of them were put out of business with their first day's work. However, they are undoubtedly going to prove a great aid, and especially for moving snow from congested points to nearly open spaces.

Just to create further interest in this matter I am going to send copies of this letter to the newspapers for release next Sunday morning, provided I hear no protest from you in the meantime.

Yours cordially,

HENRY L. DOHERTY.

February 22, 1921.

WALTER S. FINLAY, CHAIRMAN OF THE AMERICAN SOCIETY OF
MECHANICAL ENGINEERS, TO HENRY L. DOHERTY.

My Dear Mr. Doherty:

Mr. Calvin Rice has forwarded to me your most interesting letter of February 22 concerning the snow cleaning in New York.

Incidentally, you might be interested to know that I personally have taken considerable interest in this subject and had a

bit of practical experience of a peculiar type. As superintendent of motive power with the Interborough and New York Railways I conducted an experiment on rather a large scale which involved short-circuiting the channel rail of the New York Railways in order to help melt the snow in the slot. The experiment was quite interesting. At the same time while studying conditions and watching results I had ample opportunity to watch and wonder at the efforts made to clean streets in general, the poor success, and to think of the frightful cost to all of us.

I would, therefore, be most interested in cooperating with you in injecting the mechanical engineer into the study of the subject. I feel, however, that with a fair congestion of engineering meetings immediately ahead of us and the snow disappearing under a spring-like sun, it is not the psychological moment to tackle the problem. I am, therefore, taking the liberty of placing your letter in a file preparatory for next winter's program and I intend, if I am in a position to accomplish it, to place the idea of your letter in the hands of the material handling section of the society for work, development and presentation.

I realize even were we to have it the subject of our September meeting, it might not be practical to apply results to early winter service, but I feel sure with the enthusiasm back of the project, it will be far stronger than if presented during the winter's decline.

All of the above is presented to you, sir, with full appreciation of your more mature judgment and ideas, but based solely upon the situation as I see it to-day.

Yours very truly,

WALTER S. FINLAY,

50 Broad Street, March 1, 1921.

Chairman.

HENRY L. DOHERTY TO WALTER S. FINLAY.

Dear Mr. Finlay:

I received your letter of March 1st, but did not know we had a congestion of engineering meetings ahead of us.

As you were brave enough to predict in effect that we would not have any more snowstorms, I am brave enough to say that I am now ready to expect most anything—and have rather a “hunch” we will have another heavy snowstorm.

In my opinion, there is more interest in the matter of snow removal now than there will be next fall.

I confess that I have always had a very critical attitude regarding this work, largely because I never realized the magnitude of the problem until I started to offer suggestions.

I have nothing but praise for the progress that has been made by the commission that was appointed on snow removal and the work of Commissioner Leo. Nevertheless, I think vast improvement can still be made, and it seems to me now would be the time to do it when the public have been encouraged by seeing an improvement. If we wait until next fall we will lose another year in anything which might be developed.

What would you think of printing this correspondence, together with an extract of the snow commission's report, and ask for criticisms and suggestions? Then call an unofficial meeting of those who evidence interest and give them the benefit of the facts we have gathered so they can go to work on the problem and be prepared to give us some well worked out plans for a meeting to be called next fall.

I have not seen the report of the snow commission, and have not had time to attempt to make any accurate figures, but a few facts seem to indicate that we have a problem which involves a weight in excess of 3,000,000 tons of snow and a bulk in excess of 40,000,000 cubic yards to deal with for every foot of snowfall. I would like to see this compared with the weight and bulk of material handled in an equal length of time on the Panama Canal work.

No doubt many interesting suggestions would come from our members, and the problem seems to me to be of real engineering magnitude.

I am enclosing you a copy of a letter written to Mr. Marc A. Guigon, assistant engineer of the New York Edison Company.

Yours very truly,

March 5, 1921.

HENRY L. DOHERTY.

HENRY L. DOHERTY TO MARC A. GUIGON, NEW YORK EDISON
COMPANY, NEW YORK CITY.

Dear Sir:

I am in receipt of your letter of February 28th, together with your sketch of a proposed briquetting machine. As I will apparently get many letters on this subject, I am writing you in more or less detail so I can send a copy of this letter to others who write to me.

My letter to Mr. Rice was written without giving the matter much thought and with no attempt to go into all the details that I then had in mind. I do not, as a rule, act hurriedly on matters of this kind, but I felt that this might be the last snowstorm of the season and that unless a request was made for a meeting while this snowstorm was fresh in everybody's mind there would be no chance to create interest in the matter. I also felt a mere suggestion for a meeting would fall flat unless some evidence was submitted to convince our members that it was possible to improve our methods.

When I dictated my letter I did not know that a special commission had previously considered the matter, and I did not know that a practical construction man had been put in charge of this problem. However, that would not have deterred me, but would have in some degree modified my treatment of the subject. Undoubtedly the snow commission I have since read about has made splendid progress, but there is no time quite so favorable to make further progress as when everybody's interest has been aroused by having already made some progress. Also, there is no time to make progress so well as when we have a practical and efficient man at the head of the department.

I felt at the time I dictated this letter that it would be possible to design a machine which would gather up the snow, briquet and stack it, but at that time—and as I have had no time to do any designing since—such a machine was and still is, more of a vision in my mind than a definite conception. Our snowfalls are so varied in amount that this alone would make it difficult to design a thoroughly automatic machine. However, I hoped to arouse interest and stimulate men like yourself to work in actual designs.

I have received a number of communications from the article which appeared in the papers. Many of them are wholly visionary and impractical. Most of these people have no idea of the magnitude of the amount of snow to handle—and I had no data at hand to calculate it when my letter was written.

I assumed that a 12-inch snowfall meant something in excess of one million tons. Most people, however, either do not know their physical constants or else they do not use them. Most people seem to want to melt the snow with fuel or by adding enough water to melt it, or else want to wash it away with

water. A million tons of snow would require more than ten thousand tons of coal to melt it. To melt it by adding water to it would probably require in excess of eight million tons of water—but, of course, this would depend upon the temperature of the water and the temperature of the snow.

I have no data upon which to calculate the water required to wash it away. The advocates of this plan visualize the action of a fire hose operating under high pressure and forget that after the snow is once in the sewer it must have a supply of water sufficient to float it away. The sewers are very efficient in warm weather when thousands of tons of water are being drained to the sewers by snow that is melting, but I doubt if in very cold weather our sewers would carry enough water to float away any large amount of snow. The weight of snow that can be floated in this way would probably be small in relation to the weight of the water required.

I have had some experience with briquetting materials, but none with snow or like substances. Whether very cold and therefore very dry snow can be readily briquetted, I do not know. My only experience in briquetting snow is pretty well limited to making snowballs when I was a kid. However, we know that damp snow can easily be cemented together, and with little pressure. We also know that snow and water cannot exist in contact with each other, except at a temperature of 32 degrees Fahrenheit. By adding water to the snow the water will first raise the temperature of the snow to 32 degrees Fahrenheit and then melt enough snow to bring the water to 32 degrees Fahrenheit. Therefore by adding water to the snow we can bring it to a temperature and put it in a condition which we know makes it easy to briquet. The water required is very small, as the heat given up by freezing a pound of water is, as I remember it, 141 B. t. u., and this would raise 282 pounds of snow from 31 degrees Fahrenheit to 32 degrees Fahrenheit. Or, to raise a million tons of snow from 22 degrees Fahrenheit to 32 degrees Fahrenheit would require only 35,000 tons of water, costing, we will say, \$2,000. To raise the temperature of this snow by fuel would require, even at 100 per cent efficiency, 350 tons of coal, at a cost of, approximately \$7,000 delivered on the job. And, as I have already stated, it would require to exceed an additional 10,000 tons of coal to melt it.

You understand that I do not recommend briquetting as a substitute for all other methods of snow removal, but only where it is either cheaper or more desirable than other methods. Chuck what you can in the sewers where this method is cheaper. Pile it up simply as snow where space will permit—but I believe briquetting will prove a cheaper and quicker method of handling our snow than hauling it away or flushing it with water.

What I particularly advocate is making a study of each street to determine what paths shall be cleared and where the snow will be placed. Pedestrians can easily walk on top of snow, but most vehicles cut through it; therefore to push all the snow from the sidewalks into the streets makes the most rather than the least impediment to traffic. On some streets perhaps the snow should be allowed to lie where it falls until it can be permanently disposed of. If we would make up snow maps, showing what paths were to be cleared and where the snow was to be placed, we could then make plates of these maps and put them in book form, or post under glass in each block a map showing what the plan of snow handling was to be for that block.

I am glad you are interested, and hope you will continue to work on the design of a thoroughly automatic machine for gathering, briquetting and stacking the snow.

Yours sincerely,

HENRY L. DOHERTY.

P. S.—I was out of the city the latter part of last week and the first part of this week. Since this letter was written my attention has been called to the interview with Commissioner Leo in the New York Times of Sunday morning. If we have 3,500 miles of streets, as he states, a 12-inch snowfall would probably be in the neighborhood of three million tons rather than the one million tons I assumed.

H. L. D.

March 2, 1921.

Plenty of men can do good work for a spurt and with immediate promotion in mind, but for promotion you want a man in whom good work has become a habit.

—HENRY L. DOHERTY.

Mr. Doherty also prepared an exhaustive paper on the problem of snow removal, which was read at a meeting of engineers. He said:



DAM SMITH was, perhaps, the first man to make a valuable contribution on mass welfare, which is now carried on as a recognized branch of science under the term "political economy." He attributes nearly all of the progress of mankind to the division of labor, and attributes to the division of labor the creation of inventions and inventors. It has always seemed curious to me that a man as thoughtful as he was should not have recognized that division of labor was a very important invention, and that invention started before the value of the division of labor was recognized and that division of labor was a product of invention rather than invention the product of the division of labor.

The following is to me a very interesting paragraph from the chapter on the division of labor:

"All the improvements in machinery, however, have by no means been the invention of those who had occasion to use the machines. Many improvements have been made by the ingenuity of the makers of the machines, when to make them became the business of a peculiar trade; and some by that of those who are called philosophers or men of speculation, whose trade is not to do anything, but to observe everything; and who, upon that account, are often capable of combining together the powers of the most distant and dissimilar objects. In the progress of society philosophy or speculation becomes, like every other employment, the principal or sole trade and occupation of a particular class of citizens. Like every other employment, too, it is subdivided into a great number of different branches, each of which affords occupation to a peculiar tribe or class of philosophers; and this subdivision of employment in philosophy, as well as in every other business, improves dexterity, and saves time. Each individual becomes more expert in his own peculiar branch, more work is done upon the whole, and the quantity of science is considerably increased by it."

We are all too apt to think of invention as pertaining only to machinery. Human progress can be attributed almost solely to discovery and invention. Discovery is often mere recognition.

For instance, it seems to me that Newton really recognized gravity rather than discovered gravity. We first discover or recognize something, then we make some useful application of this discovery, and that constitutes invention.

I have been greatly impressed by the first sentence in the paragraph I have quoted above from Adam Smith, in that many inventions come from those following a different vocation from that in which they are able to make valuable improvements.

An engineer trained in one line of work should be able to bring some of the knowledge learned in his vocation to the benefit of those in other vocations, and I believe our society members could accomplish wonderful things by devoting a portion of their meetings to public problems, of which there seems to be no end.

Political economy, due largely to its name, has narrowed itself down to a science traveling more or less in a rut. We need to create a body of men interested in mass welfare, who, instead of shooting more or less in the air, would catalogue a list of possible activities and take up specific problems.

To talk about the various public problems in this paper would be endless, but as an illustration of activities of this sort I might mention the traffic problem as one which is becoming a serious one for a great many of our American cities, and a problem which should peculiarly lend itself to the engineer.

Another example is the mosquito problem. Fifteen or twenty years ago a great agitation swept the country for the control of the mosquito. Public interest in this question has died out. The mosquito nuisance has become progressively more serious in nearly all of the cities which I visit. New York City has become an absolute disgrace; public parks, representing hundreds of millions of dollars in value, have virtually become uninhabitable after dark. At first glance this would hardly seem to be an engineering problem, and yet what class of men have really done more to control the mosquito than the engineer? If any one of us was called upon to take charge of a construction camp far removed from health regulations we would ourselves take measures to suppress the mosquito; and among the men in our various engineering societies will be found many who could do a better job under the most adverse conditions than is now being done in the majority of our American cities.

Another problem which I might use as an example is that of housing. Revived business will make this situation acute.

As the laboring man has from time to time demanded higher pay, easier work and fewer hours, and the purchaser, on the other hand, has demanded lower cost; it has always been the discoverer, the inventor and the engineer who have had to solve the riddle—and it was frequently the engineer who was both the discoverer and the inventor.

The subject under discussion to-night is that of snow handling. The cost of handling snow in our American cities has become a heavy drain on the public purse; and probably the indirect cost, due to impediment of traffic and kindred evils, is much greater than the direct cost. What I am about to say will be largely a repetition of some correspondence that passed between myself and the officers of the society at the time of a heavy snowfall in this city.

I assumed then, as I do now, that what we want to do is to handle the snow with the least possible cost and in such a way that it will impede traffic to the least possible degree and for the shortest period of time. To do this we must clear such foot, road and drainage paths as may be necessary to accommodate each class of traffic, and must place the snow taken from these paths where it will impede traffic the least.

Great improvement can be made by paying more attention to the matter of drainage and by studying in advance where snow can be placed to cause the least inconvenience.

Snow should not be taken from private property and placed on the sidewalk or on the street. It seems unwise in every case to clean the sidewalk broom-clean and place the snow in the roadway. A pedestrian can walk practically as easily on a foot of snow as on an inch of snow, provided it is equally level; the intensity of pressure of the human foot is not enough to cut through the snow while our vehicles do cut through the snow and are greatly impeded by it.

Many of our New York streets are very narrow in relation to the width of the sidewalks. Perhaps on some streets the snow should be allowed to lie where it falls until it can be taken away. Perhaps in some cases instead of the snow being taken from the sidewalk and shoveled into the street it could better be shoveled from the street on to the sidewalk.

What I have suggested is the making of a survey of every block of every street and determining how the snow shall be handled.

New York City being long and narrow, and having a river on both sides of it, offers a much easier method for getting rid of the snow than most of our cities. Our snowfalls are neither as heavy nor as frequent as in many other cities. We are not likely to have a long period of cold weather, and we have many large trunk sewers which can be made wonderfully helpful in the disposal of the snow. But these same sewers would be practically a negligible factor except in warm weather when the sun is melting enormous quantities of snow and furnishing an abundance of water to float this snow away. In most cities the sewers would be so long as to make this method of snow removal unimportant, and except under very unusual conditions no city can afford to squander the enormous quantity of water from its water supply that would be necessary to carry away the snow.

Perhaps we should treat our snow problem in two stages, confining our initial work to a first-aid and do no more than is absolutely necessary to re-establish traffic and then proceed to the final disposal of the snow.

Perhaps we should make foot paths at the curb side of the sidewalk and to a width just sufficient to accommodate foot traffic on that street. In most cases the snow taken from these paths would be thrown back on the building side of the sidewalk rather than shoveled into the roadway. On the one-way streets one gutter should be cleared for a space of, say, one foot for the purpose of drainage, and on the other side of the roadway a path should be cleared just wide enough for one vehicle, with here and there a widening of this path to permit another vehicle to stop for loading or unloading purposes. On the two-way streets a cleared path should be made on the curb side of the walk and of a width only sufficient to take care of the foot traffic. Two road paths should be cleared on either side of the street along the curb-line just wide enough for one vehicle; and with parking spaces cleared out here and there towards the center of the street. No cars should stop in the roadway next to curb.

Freshly fallen snow generally has a density of about 1-10th that of water. Few trucks have a body sufficiently large to enable them to be loaded unless the material weighs 40 pounds or more per cubic foot. In many cases a 5-ton truck would be filled when it only had 2,000 pounds of snow on it, or even perhaps as little as 1,000 pounds of snow on it.

Snow can easily be pressed into a briquet—in fact, briquetting has already been done in connection with refrigerating machines, where the engineers had to deal with ice rather than with snow and yet there was no great difficulty in pressing it into a compact briquet.

Some difficulty might be experienced in handling very dry and very cold snow, but the addition of a small amount of water will raise the temperature of the snow to the freezing point and put in it a form to be easily briqueted. I figure that only about 70 pounds of water at a temperature of 32 degrees would be required to raise a ton of snow one degree in temperature. The water in going from a liquid to a solid state would contribute 141 B. t. u. to the mass. In other words, if you had snow at a temperature of 22 degrees you can add 70 pounds of water at 32 degrees and you would then have 2,070 pounds of snow at a temperature of 32 degrees.

It is surprising how little space would be required to take care of a heavy snowfall if the snow was pressed into briquets, permitting it to be stacked up in piles having vertical walls. If you assume that you will press your snow to a briquet having a density of 50 pounds per cubic foot you can put your snowfall into $\frac{1}{8}$ or $12\frac{1}{2}$ per cent of its original volume. If these briquets were laid up in a wall in the middle of the street and to a height of 3 feet you would then take care of a 12-inch snowfall in a 60-foot street with a wall of snow 3 feet high and 3 feet wide. Considered in another way, you could if your snow was only piled 3 feet high put it all in 3 feet of your roadway, or 5 per cent or 1-20th part of that street, and accommodate a 12-inch snowfall. The Weather Bureau told me that the heaviest snowfall on record for an entire season was less than 78 inches, while in some seasons it has been as low as 3 inches.

We here in New York would never have to store a full season's snowfall, but it is interesting to note that a 78-inch snowfall could be put into briquets and would make a wall only 6 feet high and 8 feet wide, taking up 13 1-3 per cent of the width of the street. In fact, the space required for our snowfall is so small that if it is put into a form permitting it to be laid up in piles having perpendicular sides there is no need to strive for great density—it is simply a question of what is the economical point in power consumption as against the additional space that

is occupied. However, I am inclined to think that snow would not have to be compressed to any great density to give it sufficient strength to sustain not only its own weight but almost any usage it might be subjected to.

I lean very strongly to the extensive use of briquetting as an economical means of handling snow in our American cities, but of course do not advocate this as a universal method of handling snow.

I am very hopeful that out of this meeting will spring some very valuable suggestions for the handling of snow in our American cities. However, whether this is the result or not, I think it is bound to prove wonderfully beneficial.

The average citizen has plenty of opportunity to be extremely critical about snow handling because he does not realize the magnitude of the problem. A 12-inch snowfall on 1,000 miles of streets amounts to nearly 1,000,000 tons, and the difficulty of handling it is greatly exaggerated on account of its huge bulk, which amounts to upwards of 300,000,000 cubic feet.

The correspondence referred to that passed between myself and the officers of the society last winter brought out considerable comment. It became apparent that few people appreciated the magnitude of the problem and the difficulties that are involved.

The general thought seemed to run toward melting the snow and allowing it to run off as water. Assuming 1,000 miles of street, 60 feet wide, it would require, even at 100 per cent efficiency, more than 10,000 tons of coal to melt a 12-inch snowfall.

The use of salt and salt water have also been suggested. This has some possibilities in cities already having salt water mains in some portions of them laid for fire protection or other purposes.

Calcium chloride, a by-product of the soda industry, has also been suggested.

No doubt to some the use of salt or calcium chloride would seem practical and the placing of our snow on top of buildings seem visionary and impractical, and yet putting our snow on top of our buildings might, on careful analysis, seem less impractical than many of the suggestions that have been made.

In most of our cities a vast tonnage of snow is removed by the sun's energy. If the snow could be dusted over with dirt

which would readily transform the radiant energy of the sun into sensible heat it is surprising how rapidly our snow would disappear.

Don't always go around with your mind and mouth full of the great things you can do, but really do something rather than to simply talk and think about it.

—HENRY L. DOHERTY.

The Financial World, in April, 1921, interviewed Mr. Doherty, president of the Cities Service Company, in reference to the public utility outlook at that time.

Mr. Doherty quite frankly stated that he was more of an optimist than he ever was. And, in the course of the interview he proved that he is a believer in the principle that, in order to be the right sort of an optimist, one first must be a pessimist.



IN spite of the troubles that the public utilities had during the war period, there never was anything inherently wrong with the business. Each line of public utility work still represents a public necessity and the price which must be charged to yield a proper return on the investment still will give to the public service far below any competitive service.

Given the right to charge just and fair rates, the public utility business as a whole is as sound and as safe as ever.

While the public seems to be changing in its attitude toward the utilities, there still remains much to be desired. It is true that the annual reports, and the monthly reports of the companies are showing steady improvement despite the general unfavorableness of reports of other enterprises, the work of gaining justice for the utilities is not complete.

Those who are fighting the necessary raises in price to the public utilities are actuated either by lack of intelligence or lack of fairness. In fact, it is mostly pure political bunk, and in the end the public will pay the freight plus the inevitable punishment which the present distress of some of the public utilities will cause.

No one can dispassionately look over the period since the railroads were made a political football during the last quarter of a century without realizing that no matter how much profit the railroads have been robbed of nevertheless we are now paying more for poor service than we would have been compelled to pay if we had not indulged in so much political bunk.

The public will learn sooner or later that those who are trying to make a football of the public utilities that are in distress are trying to boost their own selfish interests rather than to serve the public properly over a long period of time.

The wave of sentiment which swept the country during the early part of the past twenty years that all public utilities should be regulated was based upon the very difficult to answer statement that they, being by necessity a monopoly, should be regulated. On the theory that we were monopolies, or at least should be monopolies, we accepted regulation. However, today the street railway business, after having been subjected to regulation on the theory of being a monopoly, is now subjected to the most unfair of all competition. Motor buses are allowed to run in many cases strictly in competition with the street railways which do not attempt to take care of the long hauls and do not attempt to provide service.

What the public must have is service—and service consists of having a car pass a given point on a certain fixed schedule so that the citizens may avail themselves of this transportation at any and all times, and if a man has to catch a train by knowing the schedule of his transportation line he knows just when to start to do it.

It would cost the railway company probably 80 per cent of the entire expenses that they now have to pay out simply to give this service, running all of their cars empty, so we can say that 80 per cent of the entire cost of the operation of a railway is that of giving service and only 20 per cent is that of carrying passengers.

At the outset, the interviewer sought to confine attention to the major outlook for the utilities viewed from the standpoint of the securities. But Mr. Doherty, both by nature and business judgment, is an advocate first and last. As has been said, he believes that in order to be a really good and worth while optimist, one first must be a pessimist.

Mr. Doherty has been a fighter all his life, else he never could have risen from the position of an office boy to head of a great corporation with its activities so widespread and its field of enterprises so far reaching. So he is impressed first, and also in the midst of his expression of confidence in the future by certain factors which he believes must be corrected to make the situation all that it should be. For example:

When the cities permit motor busses to come in and divide the patronage with the railway companies they are permitting an unnecessary duplication of service which was recognized years ago as an economic error, and which was the main argument for the regulation of the public utilities by law rather than to subject them to competition.

Those who talked the most about regulation because the public utilities were a natural monopoly and should not be subjected to competition are the ones who have now entirely overlooked their basic argument for the drastic regulation which has been forced upon the public utility companies.

While we are in a receding market as to price, nevertheless many of the materials used by the public utility companies are permanently at a higher level. This works to the disadvantage of those who have been unable to secure relief as to methods of charging, but works to the great advantage of those who are given a fair price, because the higher the price of coal the greater advantages the public utility has with its large and economic machinery and its ability to get a more uniform load from a great number of customers in meeting the competition of the small electric or gas plant operated by the owner for the supply of a single factory or any other single operation.

But, on the whole, the public is coming to a fuller realization of the wisdom of treating the utilities not only liberally but justly. And in this lies reason for reassurance on the part of the great body of stockholders which, like that in the case of the steam transportation companies, has been long suffering.

It is being recognized more and more that to jeopardize the credit of the public utilities is in turn to jeopardize the credit of many other enterprises which hold the obligations of the companies.

I believe in the future of utilities that supply light, heat and power. These are in even better position as regards both actual

current achievement and prospects, than the street railway companies.

I am more of an optimist regarding the situation than I ever have been. The crisis which we are passing through and which already has been completely passed by many of the companies, will put the public utility business on a sounder and more progressive plane than it has ever occupied.

I don't know whether I ought to pity or condemn the man who wants to know all about art and literature and only enough about his business to get by with it.

—HENRY L. DOHERTY.

Mr. Doherty's views on the relation between capital and labor are well set forth in an interview given out in 1921, in which he said:



N my opinion, there never was a time when there was more ill feeling between labor and capital than there is to-day, and yet in spite of this fact I feel there never was a time when there was a better chance to find a solution of the labor problem, if it can be solved.

Whenever the demand for labor is abnormal it invites labor to assert its independence of capital, and when these times come the tendency is always for labor to be led by its most radical element. This is what has occurred during the war period. Labor went on a spree, it dictated to the employers, it dictated to the public, it dictated to the government.

Thousands of employers are smarting under the treatment they received from union labor, and I fear that many of them are so short-sighted as to be planning revenge upon labor.

Every broad-minded employer should not only refrain from revenging himself on labor, but should use all of his influence to prevent others from doing so. Revenge on labor will do nothing but bring us back to a public state of mind that has always prevented a rational determination of the limitation which eventually must be put upon the rights of labor.

Organized labor has always had the handicap of suffering from too many false friends. Pick the men of your observation that have made the greatest profession of friendship for labor and put them through your mental laboratory and see if this analysis is not true. If you will scratch one of these men beneath the surface you will find that he is not a friend of labor, but is a friend only of organized labor. Scratch him a little deeper and you will find that his friendship is based either on fear of the power of organized labor or a desire to use this power for his own selfish end.

Power attracts false friends, whether it is vested in the monarch or in the labor union. The men that crowd about are apt to be either selfish in their purpose or plain bootlickers.

The labor problem is everybody's problem, and not merely a controversy between the employer and organized labor. This is the time for the real friends of real labor to come forward. Union labor has always heretofore taken the position that anybody who did not agree with it in every particular was its enemy and its sword was unsheathed for all enemies.

The whole system from a human and economic standpoint is entirely wrong. We are told that capital is seeking the largest amount of work for the lowest wage, regardless of what is fair; and we know by the actions of the labor unions in the last three or four years that they intend to force the largest possible wage and the smallest possible work, regardless of what is fair. If this is true, there never can be a day of peace, and there will never be a day when the real friends of real labor do not look upon the whole situation as inhuman.

Too great a demand for labor will incite the labor unions to strife for the sake of getting higher wages and shorter hours. Too great a depression in business resulting in much unemployment of labor will cause the employers to force down the wages to the lowest possible notch. But at some intermediate point will be found the highest degree of peace, although probably that point will be one in which 5 per cent of all the labor of the country is without employment—and that is the inhuman feature that the real friends of real labor want to correct.

We have heard a great deal about the need for an elastic system of currency, but this is nothing compared with the need for an elastic system of labor. The one thing that the real

friends of real labor should work for is to see that all wage-earners have employment at all times, even though they do not have, in times of industrial depression, a full day's work.

In common with many others I have become alarmed by the number of foreigners who are becoming leaders of our labor unions, and the amount of foreign thought which governs the labor unions. In the last few years there has crept into our labor unions a spirit of sabotage which was never before present.

The progress of civilization has always been greatly retarded by the teachings of false economic doctrines.

The remarkable rise of the German Empire as an industrial nation—to my mind—was due not so much to anything that happened in Germany, but to what happened in England. The British workmen had always gone on the theory that their interests were best served by limiting the production of workmen and by resisting the introduction of labor-saving machinery.

A few decades ago you heard much about the so-called "Lump of Labor," which meant that there was just so much work to be done, and the less that was done by each workman the more employment there would be for all. There never was a more false or vicious theory. Under this theory Great Britain commenced to drop from her relatively strong position as an industrial nation, and the other nations commenced to forge ahead. Instead of being a nation where everybody was employed it was the one nation continually facing the problem of a greater and greater number of unemployed; and this in spite of the fact that the wage scale of England was lower than that of almost any other country.

It is my guess that many another American like myself has itched at times to take hold of some of England's industrial problems; only to be thoroughly cured of the desire to do so while investigating the subject and by learning the enormous cost of productions regardless of the low wage schedule.

We don't want our labor unions run on theories made in England or made in Germany or made in Russia. We want them run on American principles and in accord with natural and sane economic laws.

Learn mankind from living examples rather than mis-learn mankind from between covers of a book.

—HENRY L. DOHERTY.

The business situation in 1921 is well set forth in Mr. Doherty's address to the District of Columbia Bankers at their meeting in White Sulphur Springs in June of that year:



HERE is a whole country full of puzzled business men who are wondering why it is necessary to deny to business the necessary cash capital to carry it on at a time when cash reserves are being built up at a rate perhaps unheard of in the history of this or any other country.

There are many people who believe that Great Britain, with almost every character of trouble on her hands that can be conceived of, with a depreciated currency and a stock of gold of less than \$500,000,000.00, nevertheless is building herself up again into a position to make her again the world's greatest banking power, while we, with no fundamental troubles and with vast opportunities and a stack of gold in excess of \$3,000,000,000.00, are floundering around and industry is rapidly coming to a standstill.

I am not here expecting to tell you gentlemen anything that you do not know, but I was very glad to accept your invitation to address your body, for there was never greater need for the business man to understand the bankers and for the bankers to understand the business man than at present.

As perhaps some of you know, I am connected with an organization which operates public utility properties practically from coast to coast and from Galveston on the south to points in Canada on the north, supplying some form of public service to over 200 cities, villages and communities in the United States and Canada. Our organization also operates for oil in nearly all of the oil producing states and some of the foreign countries. This naturally puts us more or less in touch with business conditions over a wide spread territory, but it is through a special department that we have that I draw most of the information which will be a portion of the subject of this talk. We maintain a special department for helping to attract new industries to those cities in which we operate and to build up the old industries.

We have been having a tale of woe coming into this department for many months—and it is surprising how much of the

complaint is laid against the attitude of the bankers. A manufacturer in a Middle West city stated that the bankers of the country had lost entire confidence in the business men of the country and in the business assets of the country, and stated that if the bankers of England had not shown more faith in the business men of her country and the business assets of her country she would now be a bankrupt nation and a disintegrated empire.

I am certainly not here to criticise the banker, nor am I bringing some of these matters to your attention except to let you know how some of the business men feel about present conditions.

In the public utility business we are apt to have many complaining customers. Our own organization has always prided itself on being able to maintain friendly and satisfactory relations with its customers—although this has become a difficult thing during the past few years when everybody has been wearing their nerves on the outside of their clothes. We have in the past often taken over properties where there were many dissatisfied customers, and have always started out on the theory that we wanted to know everybody who was dissatisfied and to know what they were dissatisfied about—and I believe this policy is a good one whether it is a public utility company, a group of steel manufacturers, a group of oil refiners or a group of bankers.

The business men of the country almost universally complain that they have been denied, in one way or another, the necessary capital with which to conduct their business—and many of their complaints are against the bankers of the country. In the public utility business our customers have a few real grievances and a great many imaginary grievances. We try to correct the real grievances and explain away the imaginary grievances. When I hear the complaints that come to our Industrial Development Department I am unable to turn to any source of information and make convincing reply simply because I cannot find where the bankers have put themselves on record for the necessity for doing certain things and have supplied reasons for their policy which are either convincing or obvious.

The bitterest complaint now is the fact that business has been crucified to build up reserves which are unnecessary and

simply a whim of the banker. Another frequent complaint is the high rate that must be paid either for bank funds or by securities sold in the market. Another frequent complaint is the amount and character of collateral that is required to produce cash capital.

At the request of one of our local managers I undertook to see a rather prominent business man of his city. I had often heard of this man, and was surprised to see what a young man he was. He complained bitterly that lines of credit that he formerly had had were no longer open to him because he could not furnish collateral satisfactory to the bank. In addition to the usual collateral he had offered contracts which insured certain available revenue over a relatively short period of time, and he said that the banker said: "Well, how do we know but what all of these people with whom you have contracts will not fail in business?" I realize how conversations of this sort can be reported with a fair degree of accuracy and yet carry an entirely different meaning, but we have reached an unhealthy state in our business affairs if any great number of people, whether they are bankers or otherwise, assume that most of our business enterprises are likely to fail.

This is only one of numerous complaints that I have heard, which I will put in this form: That occasionally bankers become so nervous that if a carpenter owed them some money they would feel it was necessary to send for the carpenter and insist on his putting his tools in hock, thereby making it impossible for the carpenter to earn any money and thereby repay his loan.

I am here hoping to learn something about banking policies, and am not assuming that I can tell you anything; but I could be a splendid interpreter to a large number of business men throughout the country if you want me to act in that capacity.

Sometimes I think that a great many of our troubles of every nature are due to the fact that we have a language which has neither a constitution nor bylaws and whose vocabulary has grown so fast that it makes possible shaded and discriminating definitions of words and such definitions are not universally used.

For instance, the average young man steps out of college after having had an engineering training and when he thinks about hydraulic engineering he always thinks about head. In

steam he thinks of pressure in terms of pressure per square inch. In electricity he thinks about voltage. In heat he thinks about temperature—and yet he never seems to quite grasp the fact that all of these are simply different expressions for potentiality which could be designated by one word, thereby lessening the danger of getting mixed up and greatly simplifying matters.

Now, the banking business has some of the same inherent common fundamentals that certain other businesses have. The fundamental thing on which the banking business of the country is built would be termed “non-coincidence of demand” by some engineers (meaning that all depositors do not need their money at the same time), other engineers would talk about “load factor”, and other engineers would call it “diversity factor.”

I know of nothing where it seems easier for the ordinary man to get all balled up than when he talks about financial matters. In financial matters most people want to disregard all laws of supply and demand. The history of financial legislation through our early period, and up to a few decades ago, was one of acute stupidity. How far we have evolved towards one hundred per cent efficiency in these matters I am not prepared to say. Certainly there never was a time when we needed to know our subject better than now, when we face, first, vast problems and, next, opportunities which are so vast as to be unlimited.

I cannot find myself greatly in sympathy with the man who believes in things which mean nothing more or less than fiat money; nor can I find myself in sympathy with the man who thinks that we are always on a percentage of fiat money, for it is idle for us to think that we could ever pay on a single due date all of our obligations in gold if a 100 per cent coincident demand were made upon us. It seems to me a question of determining to what degree money can safely be issued in excess of the actual thing promised for its redemption.

Nor can I find anything sacred about some interest rate which must never be exceeded. I hope the time will come when all usury laws will be abolished except for the determination of rates which have not been fixed in advance, such as for court decisions and such necessary laws as must be made for the protection of the illiterate.

I remember that during the panic of 1907, a very prominent man and the president of a large bank said with some temper

that his bank had never charged any man more than 6 per cent for money. This man's name was not Smith but I will call him Smith. I said: "Well, Mr. Smith, you are one of the men who periodically help break this country, aren't you?" He said: "I do not know what you mean." I said: "It is quite plain to me that if money is worth more than 6 per cent and you refuse to charge more than 6 per cent for it then it goes by favor and not by merit." A rather heated argument followed this—and you can readily imagine Mr. Smith had the difficult side to defend, and he finally said: "Well, a man cannot afford to pay more than 6 per cent for money for it will ruin him if he does." I said: "Well, Mr. Smith, if I was building a dam that had cost \$900,000.00 and I needed \$100,000.00 to finish it, and if I did not finish it before the spring freshets came it would be washed out, you surely do not mean to tell me that I cannot afford to pay more than 6 per cent for money?"

In my enumeration of some of the things that business men complain of I also find that there are frequent complaints that during the last period of difficulty and high money rates that many banks have insisted on deposits against loans which were very large. This is one of the easy ways of keeping down interest rates and yet get a good return for the bank's money; but I sincerely hope that some better method than this will be found for it leads to pyramiding to a degree that is dangerous—and I believe the bankers would be the first ones to criticise a like policy on the part of business men. Mr. John Skelton Williams told me last fall that he knew of instances where borrowers were compelled to maintain deposits in excess of 50 per cent of their loans. I have heard from other sources of similar large deposits.

I am sorry that time did not permit me to make an analysis of all the deposits in the different banks and financial institutions of the country and compute the amount of reserves that this requires in relation to our entire money issue. I never look at a banking report showing the vast deposits of money without contrasting it with the relatively small amount of money that actually exists.

Almost every period of financial difficulty that we have heretofore experienced has been due to the hoarding of money by some one—and frequently by the banks.

The business men of the country are absolutely at the mercy of the bankers of the country—and especially at the mercy of these bankers when they become nervous.

For fifty years we did business under a banking law which had practically no merit as a banking proposition, and was really conceived for the purpose of selling government bonds at a previous period of great government stress.

I was one of perhaps many business men who strove to do what they could to get the bankers to agree on some form for a central bank and an elastic system of currency. While I was not in accord with all of the provisions of the present banking law, nevertheless I think it a vast improvement on what we had before—and in view of the widespread difference of opinion among bankers themselves I think we were fortunate to get as good a bill as we did. But it seems to me that our present law departed in the beginning to a great degree from the inherent advantages of centralized banking, and the tendency is for it to depart more and more.

I am often amused to read of some city that prides itself so greatly on the amount of its clearances and contrasts itself with some other city of the same relative size where the clearances are less and yet where I know that the banking conditions are intrinsically better. If some of these cities who pride themselves so much on their big clearances would take their bank capital and their deposits and create one hundred more banks with it they would, according to their standards, still further enhance their importance as a banking center.

You can have no non-coincidences of demand if you only have a single depositor, and it is only by having many different depositors with many different lines of business that a high non-coincidence of demand is obtained—and of course the highest non-coincidence of demand obtained the higher the degree of centralization, thus equalizing not only the different classes of customers but for different parts of the country.

I hope the bankers of this country will not stop studying and working for a perfect Banking Law so long as there is any possibility for improvement.

Outside of the fact that I myself can see no sense in the building up of reserves at the rapid rate that has been done in the recent past, I have little to criticise the bankers for, except

perhaps I do not think they have tried as a mass to make their position plain to the business men as a mass. Possibly explanations have been made in the president's office to the president of some other corporation, but what the bankers of this country should do is to see that the whole business fraternity of the country is informed as to what they are doing, and what they are planning to do, and try to get the business men in sympathy with it. It is not a healthy thing when the banker is afraid of the business man and when the business man is afraid of the banker.

It was fortunate indeed that we had a system of currency highly elastic in nature during the troublesome period we have just been through, but it was unfortunate for the system that it had to come into use at a time when its real merits could not be appreciated.

I believe that it is possible for this country, once working under an elastic system of currency, to never again have to go on rationed loans such as had to be resorted to in the fall of 1919, and maintained for many months thereafter, nor to force the payment of loans so long as the collateral is satisfactory other than by an increase in interest rates. I hope the day will come when money as a commodity can be had by everybody with the same ease and on the same terms if all other conditions are the same.

I regard with special importance you men on account of your nearness to the seat of government and your potentiality to guide the government through correctly on banking and financial methods, because with us business men what is your finished product is our raw materials and tools, and if we are denied tools we are helpless, whether due to the fact that the tools simply cannot be had or due to the fact that the tools do not exist.

If I were at the head of the Federal Reserve System I would propose to the men skilled in finance that unless they could tell me some very good reason for not doing so that I intended to map out the policy that would be followed by the Federal Reserve Board so every man, no matter how remote he might be either geographically or otherwise from the Federal Reserve Board, would know that we were following a fixed policy and not a matter of whim by day to day and that he could therefore govern himself accordingly; and that in event it becomes necessary to change this policy it would be by the adoption of a new

policy and the new policy would be promptly made known to the small industrial man in the most remote part of the country just as quickly as it would be known to the president of any of our large industrial corporations.

If the Federal Reserve Board will tell me, and me only, what their policy is going to be I need nothing more to enable me to build a shoe-string into a fortune. Our money policies largely fix the value of both commodities and securities. Those fortunate enough to know our money policy in advance while not generally known to the balance of the country are in equally as advantageous a position as the gambler who plays cards only with a marked deck.

The foregoing is all simply to try to impress you men with the importance of your occupation in relation to the business prosperity of this country.

I cannot speak for all business men, but I am going to speak briefly of some of the things that I have been trying to accomplish in my business career and see if they do not find sympathetic response from this audience. I know that what I have tried to do has often been seriously misunderstood by bankers, and I have been criticised for it. None of the things, however, that I have tried to do have I seen any reason for changing after years of experience and observation.

THRIFT

I am trying to do my share to make thrift universal throughout this country. So far as we now know, there is no way of providing that all workers shall be employed at all times. Only by the practice of thrift when employed can they be saved from terrible hardships when not employed. In my opinion, if we were all to go out now and put on a thrift campaign we would accomplish enough to save us vast effort and money over the next twenty years in various forms of charitable work—and how much pleasanter it should be for us to campaign to keep people from recklessly spending their money than at some later date to go out and beg the self-denying thrifty man to go down into his pocket and take out money to relieve the needs of the man who has never been self-denying and who has always spent his wages extravagantly when he had wages.

I am trying to do something more than simply to preach thrift in the sense of hoarding money either in a sock, mattress

or a savings bank. I want to induce thrift in addition to a rational bank deposit in the form of buying securities of the industrial corporations that furnish our population with work and wages.

I will not go into all of the reasons why I am a believer in every man exerting himself to make thrift universal, but I am going to ask you this question, and I hope you will take it from this meeting with you: Do you know of a single problem that this country faces that would not be entirely solved, or greatly simplified, if we could make thrift universal?

PROTECTION OF THE SMALL STOCKHOLDER

Now, if we are going to induce the workingman to invest in the business concerns of this country there are several things that we must do. First, he, as a stockholder, must get as good treatment as the stockholder who sits on the board. This is seldom the case now. It is common practice for a man to stop you on the street and ask you to give him a tip when anything is going on in your company. This man does not realize what he is doing, but he is asking you to give him information whereby he may profit at the expense of some of your stockholders who have no direct communication with the officers of the company. The loyal stockholder who has stuck by the corporation is to be induced to trade or sell his stock at less than it is worth to some man who will hold it until an advanced market price has been reached and then will resell it. We officers of corporations should zealously guard the welfare of our stockholders no matter how small or how remote their situation may be.

MONTHLY STATEMENTS

For years I have pursued the policy of issuing a monthly statement to all our stockholders which is just as complete and just as accurate as any annual statement could be. I have heard a good many men say that such a statement could not be issued in their business, but I have never seen a business in which it could not be done.

CONTINUOUS INVENTORIES.

I do not know whether I am the first man to adopt the policy of taking continuous inventories, or not, but I know inventories can always be made to represent a greater accuracy if it is made a continuous work going on throughout the year rather than a periodical shut-down and hasty and oftentimes erroneous count

and many errors in calculation. A trained group of men continuously checking up back inventories will finally reach a great degree of accuracy—and it is the difficulty of inventorying on which many business men plead off for not making monthly statements.

During the past few years we have seen how corporations could go from small earnings to extremely large earnings and from extremely large earnings into bankruptcy and the stockholders be totally uninformed as to what was going on, while those close to the management had a pretty good knowledge and could make this inside information profitable.

Inventorying is not difficult when you make it a matter of constant study. Whole warehouses can be sealed and once counted they do not have to be counted again until they must be reopened and drawn upon. Bays and bins in warehouses can be filled and counted and then sealed so that only the broken stock in reopened bays or bins must be counted—and you can carry this on until it is surprising how little of your entire stock must be subjected to an actual counting and calculation due to its state of manufacture.

MONTHLY DIVIDENDS

I am a great believer in monthly dividends, and perhaps have been identified with them to a greater degree than any other man in the country. This earned for me in the early days an enormous amount of criticism from the banking and financial element of the country. As years have gone on monthly dividends have become less repulsive, and many men have probably forgotten where they first got their greatest impetus.

It is astonishing to me that financial men should be so reluctant to pay monthly dividends and monthly interest. Business had a fight of many decades to get the settlement of its bills on a monthly basis. The old long time credits, with all the opportunities for disputes and losses that arose under them, have been gradually abolished except in a few lines of business. The monthly settlement of accounts has been a wonderful factor in contributing to the stability and safety of business, and no group of men should be more in sympathy with this matter of frequent settlements than the bankers and financial men, and yet they have been the only ones that have tenaciously stuck to the matter of long time settlements and have criticised those who have advocated otherwise.

Years ago I inaugurated the policy of trying to sell to our public utility customers stocks in the utilities that served them. Can anybody justify by sound reasoning why we should ask our customers to pay their bills once a month and then have the company tell them that they will pay them the interest or dividend once every six months or once every year?

I am sorry time does not permit me to go into this subject more at length. If considered dispassionately I think the verdict would be in favor of the settlement of both interest and dividends monthly.

People ask if it is not a great deal of trouble and expense to pay monthly dividends and interest. First, it is not a great deal of trouble and, second, the benefits more than compensate for this. You cannot run an office smoothly when you have periodical interest and dividend dates occurring once in six months or once in a year, but when you reduce this work, as all other work is reduced, to a monthly cycle it takes care of itself without executive attention.

THE USE OF A FIXED DIVIDEND POLICY AS AGAINST SPASMATIC DIVIDENDS

Every corporation, depending upon the nature of the business and its capabilities, should create a reserve against unforeseen depreciation and unforeseen emergencies, and therefore all earning should not be declared out as earned. Neither should earnings be allowed to accumulate without a definite and announced plan of how they will be used for otherwise you are inviting at some time when market conditions seem particularly propitious what I term a dividend spasm. If a corporation finds itself in a position to pay out a 100 per cent dividend in my opinion it ought to be paid out over a long period of years and according to a fixed dividend policy which starts in with a very small amount and increases year by year. This makes it practically impossible for the smallest and most remote stockholder to be put at any disadvantage with the best informed stockholder. It also contributes to the stability of the business.

STOCK DIVIDENDS

The bonds and the so-called preferred stocks of the corporations which are forbidden to share in any prosperity of the company beyond a fixed amount are entitled to either be continually

lessened in their outstanding amounts or else continually have more property to represent these securities.

For years I have advocated the use of a clause in a mortgage which provides that either a certain amount of bonds must be retired or else a certain fixed amount of additional property must be added for which no bonds are issued. This I think is a particularly desirable reform in finance. Often periods of prosperity come which enables the company to add greatly to its property by the investment of excess earnings and permits the company to take care of its mortgage obligations for a long period in advance and thus lessen the strain during some subsequent period of adversity. The common form of sinking fund often requires you to take up bonds from people who do not want to sell them and sell bonds at the other end of your mortgage to people who have to be induced to buy them through salesmanship.

As extensions may be required at periods when bonds are not readily salable I think you can all see how it is easily possible to give your bondholders a greater degree of protection and more liberal treatment if the company has the option of either increasing the amount of property or diminishing the amount of the issue.

If the cash dividends on common stocks are limited and excess dividends are paid out as stock dividends it is no particular hardship to the common stockholder and a great benefit to the bondholder and preferred stockholder and adds wonderfully to the security of a bond or a preferred stock issue and thereby contributes to the stability of the business as a whole.

DEVELOPMENT OF MEN

If I am ever known for anything I would prefer to be known as a man who could develop men rather than a man who could pick men.

For many years I have preached, and have practiced what I preached, that every business should establish methods for the education of the men necessary to carry that business on. Many men have done this, and perhaps for many decades, and yet it has only now got a serious hold in our industrial life. We maintain a regular educational department and, while our courses are not as complete as I wish they were, or as I hope they will be, they have been wonderfully effective.

This is one of the points to illustrate how bankers can encourage that which they see in business life which they think is good and which they think should be made more general, for I doubt if you bankers know how influential your views are with your clients.

The big problem is not how to discourage enterprise by shaving earnings to the vanishing point and endangering every investment.

The big problem is how to develop our opportunities—how to make more land available by railroads and other means, so a rapidly growing population can be fed, and fed well and cheaply.

The corporation is the poor man's partnership and often the poor man's most valuable servant.

—HENRY L. DOHERTY.

At a special meeting of the Board of Directors of Cities Service Company held late Friday afternoon, June 10, 1921, President Henry L. Doherty recommended to the board that all dividends then paid in cash and stock on the stocks of the Company be continued but, beginning with the dividend payable July 1, 1921, that these dividends be payable in scrip. The board concurred in Mr. Doherty's recommendations, and for some time the monthly dividends on all classes of Cities Service Company stocks were paid in scrip. This action, of course, did not affect payments on the interest-bearing securities of Cities Service Company or subsidiaries, but the conservation of cash resources of the Company, through the deferring of cash dividends greatly strengthened the position of all interest-bearing securities of the Company and subsidiaries.

Mr. Doherty, in making his recommendation to the Directors, read from a memorandum, which he had himself written, in which he reviewed the action of the Board of Directors at the beginning of the great European war in 1914, calling attention to the benefits which accrued to the company and its stockholders from that action, recalling the fact that the deferring of dividends in 1914, was followed by action of the Board late in 1915, rewarding in a most substantial manner the stockholders for any hardships undergone through the deferring of these dividends for a time.

Mr. Doherty further called attention to the then chaotic conditions existing in the oil market, stating that in his opinion lower prices for crude oil were practically inevitable, this belief, of course, being fully sustained by reductions the first of the following week from \$1.50 a barrel to \$1.00 a barrel in quotations on Mid-Continent oil. Relative to present conditions in the oil industry and the effect therefrom upon Cities Service Company, Mr. Doherty said to the boards:



DEVELOPMENTS in the oil business in the last few days convinces me that an early recovery from the state of demoralization is improbable and, therefore, we should again conserve not only our resources, but our oil resources as well, and after earnest and careful thought I am again recommending to you that action somewhat similar be taken, with some modifications, and by such prompt and decisive action at this time we will be able greatly to increase the value of the Company's assets, and be able not only to resume cash and stock dividends at an early date, with the payment of all scrip issued for dividends as well, but will be able again to reward our stockholders in a handsome way for having accepted a change from our present dividend policy to one wherein we will issue only scrip.

"The oil business differs from the ordinary business in that you cannot at will increase production to meet an increase in consumption either in a reasonable time or by a reasonable advance in price. Nothing but a long period of time and often only by doubling or trebling the price can production be stimulated sufficiently to meet the demand. In any ordinary business, production can at will, and practically overnight, be reduced to meet any reduction in demand. In the oil business production as a whole must go on regardless of a lessened demand or a lessened price. In fact even now offset drilling must go on even when there is already a glut of oil in the market or the lease of the land may be forfeited. We are now in a period of an over-supply of oil and owing to depressed business conditions, difficult financial markets and a lack of storage, prices have become demoralized and have reached levels which are far below what have to be paid at a later date. Storage of oil is expensive and funds for tank farms are difficult to get and an unwarranted cost must be paid for fresh capital necessary to provide storage

capacity and to buy the oil. We are one of the few companies that hold large tracts of land that cannot be seriously drained by neighboring leases and whenever possible it should be the policy of the company to hold back the production of oil and wait for a period of better prices.

"The proven oil acreage of this entire continent is being drained at an alarming rate and no long period of time will intervene until we will again have a demand greatly in excess of our supply which would quickly exhaust the stocks of oil above ground and necessitate a radical change in price in an upward direction aimed both to curtail the demand and to stimulate the supply. It is admitted by nearly all of the thinking oil men that the present overproduction of oil in relation to the demand will be of short duration and that then nothing less than a miracle will save us from an oil shortage more acute and protracted than anything the industry has heretofore faced. While Cities Service Company holds a vast acreage of proven oil territory and has more than three million acres of reserve territory which has been selected as of high promise, nevertheless we cannot justify the policy of removing any of this oil from its natural storage or the sale of any portion of it that must be taken from the ground if it can be avoided. With a surplus of oil at this time and the certainty of a shortage at an early date it would seem an easy and simple matter to store during a period of overproduction against a period of famine which is so self evident, but of the many who would like to store oil at present prices there are but few who can provide the necessary funds for the erection of tanks and the purchase of oil.

"The difficulty of raising funds, which not only confronts the oil industries, is the chief cause for the present low cost of oil and the plan of conservation recommended to this board will, we believe, be followed by others and will to a great measure reduce the period of demoralization. My recommendation has only been reached after numerous conferences with many of our most notable oil men. Nearly all agree that the present excess of production over demand cannot last long and that we must face a period of shortage. As many of you know, I have been working for weeks to induce the principal factors in the oil business to agree upon plans and effective corrective measures to care for the present excess and to provide for the inevitable shortage. It has seemed to me unthinkable that the oil

industry would allow this situation ever to reach the present acute stage without adopting measures to take care of it, but financial and legal difficulties have seemed insurmountable even to the officers of the companies with seemingly the greatest resources. Had I realized that no corrective steps would be taken by the oil industry I would have recommended this policy of conservation at an earlier date. However, from a purely selfish standpoint I think the greater the demoralization at this time the greater will be the reaction and consequent benefit which will accrue to us and to other large producing companies at a later date.

"We prefer not to be factors in the further demoralization of this industry and believe that such extreme changes as have already taken place in this as well as other commodities are detrimental to the best interests of the public. The production of oil for this continent for 1920 was in excess of 600,000,000 barrels. Figuring cost for oil, including gathering charges, transportation charges and the erection of tankage as a total of \$3.00 per barrel, it would require nearly a billion dollars to store a six months' supply of oil. It has also been held by the attorneys of a number of prominent oil companies that any agreement looking towards a curtailment of production might be construed as a criminal act under our laws regarding agreements in restraint of trade. Action on the part of any one company in the matter of withholding oil from the market must be independent of any agreement on the part of any company. Nevertheless the opinion has often been expressed that such an action on the part of any one company would probably be adopted by others. For the present neither the funds nor the empty tankage seem to exist or to be forthcoming to take care of the over production of oil. An easy market for funds would change the situation materially for many concerns are anxious to erect storage and buy oil for future needs. The net earnings from our public utility properties will be larger this year than ever before in our history, are well stabilized and satisfactorily increasing.

"By paying our dividends in scrip it will bring no hardship to those who do not require their dividends to pay their expenses, and to those who must have cash for their dividends it will be equivalent simply to a reduction of income in whatever amount they must sell their scrip below its face value.

"When we deemed it advisable to defer our dividends in 1914 the situation arose so quickly that we were unable to know best how to meet it. Had we used a scrip dividend at that time it would have proved a lesser hardship to our stockholders and would have greatly hastened the time when we could have resumed our usual dividends according to our plans. In 1914 we had assets which we knew would greatly augment the earnings of the company which our stockholders and the public knew little about and would have had given but slight appreciation to them under the stress of conditions as they then existed. The same thing is true in even greater measure now.

"We have sources of increased earnings which can soon be made productive, and as this fact is realized by increasing numbers market depression will be rapidly superseded by improvement for both stock and scrip to a point which will leave nothing to be desired by any of our security holders. There is no cause for alarm over the ultimate outlook for the oil industry, but it must right itself through a conservation of its affairs. We have built up a vast property and have reinvested large sums from earnings, and can look forward with confidence to the sustained earnings power of these properties under normal conditions."

The man who waits until a crisis arises and then insists that it must be settled his way or not at all is simply an obstacle to progress.

—HENRY L. DOHERTY.

Mr. Doherty, after the special meeting of the Board of Directors, in speaking with newspaper men on the decision to pay scrip dividends, said:



THE decision of the Board of Directors on my recommendation to provide for payment of dividends in scrip instead of in cash was taken to conserve cash resources of the company in order to meet present abnormal conditions in the oil industry. Equities back of Cities Service Company stocks are many times the amount presented in the value placed on them by present market prices of the stocks.

"In addition to its many utility properties net earnings of which are now at the highest point in their history, Cities Service

Company controls what are probably the most valuable oil producing properties in the United States. Of these properties, upwards of 50,000 acres have actually been proved by the drill, and are located in some thirty-five of the most prolific oil producing pools of the great Mid-Continent field. In addition, the company controls more than 3,000,000 acres of lands of potential oil producing capacity so far as can be determined by geological examination. Cities Service Company has reinvested in subsidiary properties approximately \$73,000,000 from surplus earnings, in addition to many millions of new capital. As of date of May 10, 1921, total surplus and reserves of the company, exclusive of surplus and reserves of subsidiary companies, were \$53,182,000

"I am more confident of the ultimate value of Cities Service Company stocks today than I have ever been, despite the present depressed and demoralized condition of the oil industry, which I believe is but a passing phase in the history of this great industry and will be succeeded by an era in which the great oil producing corporations of the United States will see the greatest prosperity in their history.

"Stockholders should not overlook the fact that they are to receive scrip dividends on both their common and preferred stocks and also scrip representing the stock dividends on the common stock, and also should remember that when in 1914 dividends on Cities Service Company stocks were deferred, at the outbreak of the European War, that those stockholders who put full confidence in the company were most handsomely rewarded by the ultimate great increase in the value of the warrants issued in lieu of the deferred cash dividends."

Any country has both capital and labor to do anything it wants to do, and most countries have enough natural resources. But it is the man who stands between who is able to get capital, and at the same time to handle labor, train it, organize it and everything of that sort, who is the important man in the development of the country and in the development of all business enterprises.

—HENRY L. DOHERTY.

The petroleum situation, and the difficulties confronting the industry, are well set forth in an interview on Mexican petroleum given out in 1921, in which Mr. Doherty said:



HERE is never at any time an exact balance between the production and the consumption of petroleum. There is always either more being produced than is consumed or more being consumed than is produced.

Generally speaking, the consumption is always in excess of the production, and whenever crude stocks of petroleum are seriously threatened with depletion prices for crude products are advanced, and many other different steps taken to stimulate production. A substantial increase in price can always be depended upon to increase production more or less and in the past some new field has been discovered every few years, often giving an opportunity to completely fill the storage of the entire country.

The business and financial world has learned to speak of over production as an accumulation of vast stocks of materials in excess of the market's needs. From this standpoint there is no overproduction of crude petroleum. In fact, the stocks on hand represent only enough to supply the current demands for a period of a few months. However, the current production of petroleum is in excess of the current consumption, and this is the reason why the posted price for crude oil has been reduced.

The United States production of crude oil is still well below the United States consumption of oil, and falls far short of supplying our needs both for our domestic consumption and our normal rate of export; but the Mexican production has grown of late at an astonishing rate.

For a good many years prior to 1910, Mexico was a producer of petroleum in a small way, but practically none of this petroleum was exported from that country and the Mexican fields were a negligible factor in the world's petroleum supply. In 1910, the Huasteca field was discovered. This proved to be a long narrow strip of oil bearing structure, extending from Dos Bocas south to Alamo for a distance of 45 miles, and the various pools making up this field were rapidly opened up. In 1912, the first exports of Mexican petroleum were made to the United States,

and the United States is now receiving imports of Mexican oil at a rate in excess of the entire amount of oil that the United States itself ever produced up to 1908.

From the date of the discovery of the Drake well in 1859, to 1909, the United States managed to build up a production of oil which at the end of 50 years amounted to 183,000,000 barrels, while Mexico from 1910 to 1920, built up her production to 180,000,000 barrels.

The known oil bearing territory of Mexico is entirely dissimilar to practically all of the oil bearing territory of the United States. Mexico with only 25 square miles of proven oil territory is producing 40 per cent as much oil as the United States, which has 4,500 square miles of oil bearing territory.

The largest part of the known Mexican oil lands have already been exhausted, and the oil remaining in the proven fields of Mexico is now estimated at from 275,000,000 to 350,000,000 barrels. This would represent a little more than a six months' supply to the markets now supplied by the United States and Mexico.

It is expected for 1921, that the United States production will fall off and the Mexican production will increase, and that the Mexican production will equal more than 50 per cent of the entire United States production.

The last known pool in Mexico is now in early stage of development. Of the nine important pools in the Huasteca field five are now entirely extinct, two others are rapidly going to salt water (and the larger of these two fields will probably be extinct before the early summer), leaving only one partially exhausted pool, together with the pool that is now being opened up, and which can be regarded as practically a virgin pool although already some of its wells have gone to salt water.

The oil industry and the oil consuming public have two important problems to meet, viz., how to take care of the current overproduction of oil for the next few months, and then at some later time (from eight months to two years from now) how to make up the deficiency caused by the exhaustion of the Southern Mexican fields—for at that time a shortage of oil will occur unless some new fields are discovered in the meantime,—which will force us to face a famine in oil which has been unprecedented in the petroleum industry.

It is not likely that the discovery of any field would be able to relieve this apparent certainty of an oil famine unless it should be discovered practically at tidewater or else at a point where it could rapidly be reached by large numbers of our mid-continent pipelines.

As already stated, we have not yet reached the point where we have a surplus of petroleum—in fact, there is less than a normal stock of petroleum on hand; but the present rate of production is exceeding the present rate of consumption, and if an attempt were made to store all of this oil we would find ourselves by the end of this year with abnormal stocks of petroleum and petroleum products.

To encourage production and to attempt to store these stocks would require vast financing and the building of much additional storage capacity, as the empty storage capacity of the country is not sufficient, or is not properly located, to take care of this excess production.

It therefore seems that there is no other course open to the production companies except to discourage the production of oil by cutting the posted price.

Oh, for more such men as Peter Dooley, who would expose the shams of politics and politicians.

—HENRY L. DOHERTY.

At the meeting of the American Gas Association for 1921 Mr. Doherty gave a comprehensive talk on rates and the conditions which had revived interest in a modified rate method. He said:



WAS rather disappointed when I saw so many of the commercial men get up and leave the room before the paper ["Report of Committee on Rate Structure"] was up, and I felt that none of those men realized how a proper rate is the very foundation of all of your commercial work. All of these other things that you discussed here collectively I do not believe are as important as this.

When we talk about how to sell our appliances and how to sell things of that sort we are talking about something that is, of course, based on our method of selling gas, and the method of

selling gas is the important thing. The reason we have not secured the adoption of the readiness-to-serve method of charging—and we have secured its adoption in one state by the state commission over the protest of the distributing company—when you tell us that we cannot do this thing, I say to you that the reason we cannot do it is solely on account of not having the industry solid on it. It has always been on account of the opposition within the industry itself, and, if I may, I want to point to a sort of a parallel example. You know they always say that improvements in any industry are very apt to come from somebody on the outside—that is, because we are always apt to think that the thing we are doing is right. Whether we think the thing we are doing is right or not, we men in a given industry, as a rule, cannot agree on what changes should be made.

The thing that I want to draw an example from is the banking situation in America. At the time of our Civil War our government was pressed for revenue and unable to sell bonds, and they created a banking bill which made government bonds the basis for all currency issues. Every financial expert will tell you that the last thing in the world that you should base a currency system on would be a long term obligation; but it must be something that is self liquidating. Now, in spite of the fact that that was the rottenest banking bill that man could have conceived of, it took us fifty years to get rid of it. Not only that, but if it had been left to the bankers of this country to frame a new bill, we would have had it for another fifty years, because they could not have agreed on anything. It was only because a few men took the matter up in Congress and forced the adoption of what was intended to be a central reserve bank and an elastic currency that we can after fifty years get rid of that bill.

I cannot for the life of me see why gas men should be willing, in justice to their customers, in justice to the public, in justice to their stockholders, to stand ready to give service to a customer without an adequate consideration. It is not generosity on your part. You are just robbing somebody else. You know if you ask a workman just to stand by and be ready to work that you are lucky if you do not pay him 50 cents an hour.

What are they willing to pay us an hour? If we asked them to pay us a cent an hour to be ready to serve them with gas they would pay us \$87.60 a year.

In any method of figuring this customer charge would in most cases amount to not to exceed \$12 a year. Imagine anybody that can afford to use gas at all that cannot afford to pay \$12 a year.

I want you commercial men to get interested. I am particularly anxious to see you commercial men get interested in this problem. Take your accounts and figure what it would mean if you would collect \$12 from every customer, and what the profit of your company would be. Then you have a proper basis for the consideration of the demand charge.

We must have a limitation to any customer's right to demand service; that is, he must pay according to his demand; and while I cannot go into that in great detail here you will see how when you commence to get cost down, you will be in a position to invite all sorts of uses for that gas. Many of those uses that will be most highly desirable will be industrial uses that run twenty-four hours a day in some instances, 365 days a year, business that you cannot touch now on your present rates, because your present rates are figured on a weighted average, and one-third of all of your customers are not only paying for their own gas, but they are paying a profit on their service, they are paying for your loss on $66\frac{2}{3}$ per cent of your customers, plus the matter of paying a profit on $66\frac{2}{3}$ per cent of your customers.

Somebody here on the floor emphasized the fact that we must have a rate that will be a good rate. I go further than that and say we must have a rate that will make that business pay all that it costs us, and I say to you—and I know by experience—that if you charge all that the cost amounts to the amount of business that you will lose will be negligible, and, further, it will be a desirable loss.

I do not wish, Mr. Chairman, to try to discuss this paper and elucidate the points of merits, because I realize that today there are a great many men in the room who have been more conscientious students of this matter in the last few years than I have been and they can probably find more apt ways to illustrate what is meant. I do, however, feel that we ought to avoid controversies over more or less immaterial things. Of course, it is largely discretionary as to where we place these different charges. It is more or less a matter of opinion.

The last speaker spoke about the fact that certain charges ought not to be placed on the customer, that he could not understand why any portion of the main cost should be placed on the customer. Well, I am heartily in sympathy with what he had to say, and yet if somebody else would stand up on the floor and say why shouldn't the customer charge include all of the expenses necessary to maintain a minimum size main on the work and a minimum distributing system I would have had to say that his position was very logical. You can very easily distribute that customer's charge so as to do the minimum work and a minimum distributing system, and only the additional amount for heavier demand should be put onto the demand charge.

Now your committee has done, I think, a very wise thing in having standard system reports, showing just how this division should be made. I think the way for us to make progress would be for each man who does not agree with your committee to take the specific recommendations that they have made, make a true division of these, and then supply each case in writing and send it to your committee just where he differs from your committee's recommendations. Then you would make great progress.

I notice again toward the end of the report here that you largely emasculate what has been said in the previous portion of the report. I believe that I am telling no secrets or reporting nothing that I should not report when I say that the board of directors of the American Gas Association had a meeting at Atlantic City last May and invited a number of men prominent in the industry to come down and have a conference—mostly nearby people. It was not intended to make it a convention, but to have a sort of free exchange of views. These men considered particularly the question of a service charge, and after considerable discussion they all voted unanimously that the gas business must have some form of service charge, or its equivalent—the wording was rather inclusive.

Then a motion was made that every gas man should contend as a matter of principle for the absolute adoption of the three part method charge, and that any departure from that method should be in the nature of a compromise, and not in the way of an acknowledgment that any other thing was just or equitable; that is, that they should stand out for that as the thing that we are entitled to.

I want to call your attention to one thing that is made possible by the latter portion of this report. They speak about doing this or doing that or doing the other thing. Personally I would like to see the whole of this association go on record and say that the one thing we must have is a three part rate, that the complete adoption, the universal adoption of the report is necessary, and any departure from this principle would be in the nature of a compromise, not in any way departing from the principle, not in any way acknowledging that the principle was not the correct principle; because we cannot afford to have optional methods, we cannot afford to let this man buy gas under a schedule of charging, which gives him the advantage of the company, and permit some other man to take another optional system of charging, which gives him the advantage. The ideal is the universal application so that the man who is now paying less than he should pay would not continue to do so.

I do not care how high your horizontal rates are now, you cannot make a horizontal rate that is high enough to take care of these charges that companies are put to. You have available a lot of gas, an unknown amount of gas, and you cannot apportion these actual fixed expenses in this unknown amount equitably nor, over a small amount, at all.

I might say, Mr. Chairman, that during my thirty-nine years of continuous employment in the gas business that I have been at different times almost everything in the gas business, from the office boy and the fellow that unloaded hay and got hot coke out of the retorts to making fires in the offices. I have also been the new business man, I have been the accountant, and helped to make our original standard system of accounting. In all these years that I have been in the gas business there has never been a time when I have felt so encouraged over the future of the gas business as I do now, largely due to the fact that we have reached a time when we have a more adequate membership in our association, where we have a more tolerant membership, where we are not trying to force the adoption of old methods, but where we are ready to adopt the new.

A great deal of this change has come about by the war necessities, by a condition that arose which none of us could foresee. What we have heretofore done in the gas business is very, very small. I have stood for a number of years for certain

things. I believe it was right, and I have no reason to change my opinion, my conviction. I feel we must have a rational system of charging—a system of charging that compels every customer to pay all the expenses that he occasions. That is fundamental, that is the most important of all.

One of the other points that I have no right to bring into this discussion is that we must give each gas company a chance to serve that kind of gas that it can serve best, depending upon its local conditions, especially its market for raw materials. Have a fairly rational system of specifications for gas, not requiring the same special B. t. u. density; that is, not requiring that we should have so many B. t. u. in a cubic foot, and give the right to make gas that is satisfactory—getting away from this obsolete standard created at a time when gas was used solely for illuminating purposes and we had no mantle lamps.

If we can have a rational system of charging, if we can make gas satisfactory for the purpose for which it is going to be used, regardless of these obsolete notions, the gas business has a future that to me is bigger than any other business that I know of in this country, and I hope I will live to see it realized, although I confess that progress at times has been slow. It may interest some of these men to know that the original paper on the readiness-to-serve method of selling public service gas and electricity was read at a Chicago convention of the National Electric Light Association in the hotel across the street twenty-one years ago last May.

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In all my experience in trying to secure changes in different lines of business that I have been in—street railway, electric light, gas and oil—there has always been the tendency to urge that no change be made unless it could be one that reached 100 per cent perfection. In other words, there are many men who, if they owed somebody an indefinite sum of money and could not exactly say what it was, would say, "I do not owe you anything."

Now, in a matter such as the Federal Reserve Bank bill, I was one of the men that did a great deal to try to bring about the passage of that bill, and yet I know that bill comes a long way from either giving us a centralized banking system or an elastic system of currency, but it was so enormously better than anything

that we had that it was up to us to accept it and thereby make that great big step, then perhaps get the improvements that would bring it to the 100 per cent perfection.

The reason I suggested that the discussion should be limited to fundamental things rather than an allocation of costs, was because every man in this room could have a slightly different opinion on how these costs should be allocated, but, nevertheless, there would be no very great difference in the end. If every man in this room would go through that allocation and then write to the committee, giving his reason for the allocation that he made, then the committee in a subsequent report could come out and say, "This is our final recommendation as to allocations."

I cannot get up and think on my feet and say this should be that way, this should be that way, and feel that I am doing it with any great degree of accuracy, but if I was back in my own office studying these sheets then I could do it very readily.

So far as this matter of distance is concerned, that is a point that comes in continually, and yet there is a very easy answer to that, and the original readiness-to-serve method of charging included a distance factor, but the primary thing that makes this system and that justifies this system of charging is, that we are a public-service corporation; we are engaged to supply everybody within that municipality, no matter where they are, and you cannot figure distance very well and justify it. Perhaps distance must be taken into account to get 100 per cent equity, but we cannot figure it very well, because we do not start by putting our gas works in the center of the town. Very often our gas works are outside of the city and that man who is on the line coming into the city will say: "Why should I pay the same as a man at the other end of the city?"

So we decided to eliminate the question of distance from either the center of the city or the distance from the gas works, and assume that everybody inside of that municipality was entitled to service.

When it comes to a discussion on the allocation of the charges there would be no limit. You could talk here from now until next November, but you should take this wonderful step that not only brings you close to 100 per cent equity, but also gives you such an opportunity for the sale of additional gas and does so much to put the gas company on a profitable basis.

In the gas business when you charge so much per thousand feet you are charging an inequitable rate, but when you adopt the readiness-to-serve method of charging, even if it is in its crudest form, you have made an enormous step from practically no equity whatever to 80 per cent equity, and then when we have 80 per cent equity let us get as nearly as we can to the 100 per cent, and then let us try to pull it up to 100 per cent equity and 100 per cent ability to get business.

I would like to have everybody believe in me but whether they do or do not I want to always live so I can believe in myself.

—HENRY L. DOHERTY.

At the 1921 meeting of the American Petroleum Institute Mr. Doherty was called upon for a paper on the petroleum situation and the remedies he proposed for it. He said:



ANY of us believe that we are passing through a critical period in the oil business, and the problems ahead of us may be very different in many ways than the problems heretofore experienced.

I am writing this paper by assignment and request, and am really not attempting to bring out any point of importance other than to predict that the oil business as a whole will require capital on a scale heretofore unheard of. If I am right in this and can convince the men in the oil business that this is true, they can then better meet this problem by having a longer period for preparation.

Other speakers are assigned the various subjects such as the future supply of oil, and I will not touch on this except to say that I have assumed that there will be no such thing as an exhaustion of our raw materials from which the paraffin series of hydrocarbons can be produced. In other words, as I have stated to some of the representatives of the automotive industries, they will have gasoline so long as they live, their children will have it, and their children's children. If this is true, it follows that the industry as a whole does not have to be amortized, but only such portions of the equipment used in connection with certain fields or certain forms of oil become unuseable.

As early as 1894 I tried to convince Prof. N. W. Lord and Prof. Edward Orton, Sr., of the Ohio State University that natural gas and oil were of inorganic origin. Since then I have concluded that the paraffin series of hydrocarbons are rather a natural and easily formed chemical compounds, and that they are probably of both inorganic and organic origin. Methane, which is the smallest molecule of the paraffin series, is formed readily from hydrogen and carbon monoxide in the presence of nickel at a temperature of about 450 degrees Fahrenheit, if my memory serves me properly. At other pressures and other temperatures, and with other catalysts, probably other or all of the members of the series would be formed. Many of the market carbides form hydrocarbons when brought in contact with water, some forming the paraffin series. These and other facts lead me to believe that natural gas and oil are more abundant than is generally believed, and will be found pretty generally the world over.

Nearly all bituminous matter will yield some paraffin hydrocarbons or their substitutes. For instance, ordinary coal will yield a considerable amount of paraffin hydrocarbon when distilled at a low temperature. We also have enormous beds of shale which are doubtless scattered pretty well throughout the world which insure an enormous supply of petroleum products whenever these beds can be economically used as a source of raw material in competition with oil which flows or is pumped from the ground.

Just how we are to meet the continually increasing needs for petroleum I am not prepared to say, but have no doubt in my mind that an abundant supply will be had for a long time yet to come, for all of what might be termed the superior uses for petroleum, such as gasoline for motor cars, motor boats and flying machines, oil for lubrication and the waxes. The demand which is immediately ahead of us I assume will be met by the development of oil fields in the foreign countries.

I also assume for the purposes of this address that the business will be carried on as a nonrestricted competitive business. By this I mean that while the oil business has suffered to some extent by Government regulation and meddling, it will by no chance be subjected to Government control and regulation, such as has been justified in theory for those lines of business which

are best conducted as monopolies. The tendency to subject all business activity to more or less Government regulation has been brought about largely by the advocacy of the regulation of those businesses which could best serve the public by being protected to a greater or less degree as monopolies. I cite as an example of this class the railroads of the country and the public utilities of our cities.

Regulation has proven so harmful to the public that a large portion of our thinking citizens realize the danger of disaster by regulation, and this realization of the danger should bring about more intelligent regulation of those businesses which are regulated and greater freedom of action of those businesses which are competitive rather than monopolies in character. This does not mean that I am against all regulation of business, or that I refer to any class of people as being against all regulation of business, but does mean that many people are convinced that unwise or overly severe regulation is worse for the public than no regulation at all.

When the United States was laying the foundation of its greatest wealth and prosperity it was not reflected in the figures going to make up the so-called balance of trade between it and the foreign countries. In fact, there is no such thing as a balance of trade between countries stretching over any long period of years. The United States could have possibly reached even a greater position of prosperity, and with the apparently alarming situation regarding the balance of trade with foreign countries, if more internal improvements had been made and the bonds sold to foreign owners. Vast sums of wealth were made available for the development of this country by the sale of corporate securities in foreign countries, which secured for us in this country internal improvements which were of vastly greater benefit to the users than to the bondholders and stockholders.

These railroads were built originally on the theory that the owners would be allowed to earn whatever they could. The hope of big rewards stimulated railroad building. In my opinion the public would have been vastly better served and more cheaply served in the end if no regulation had been attempted. The regulation of the railroads was antagonistic in nature, and drastic beyond the point of common sense. The punishment

to the stockholders of the roads, and in many cases to the bondholders, was rather severe, but the punishment to the great public was terrific, and the folly of this regulation would have caused the loss of the war to the Allies if it had not been for the petroleum industry.

When this regulation became antagonistic and active we were a rapidly growing country with more mouths to feed and more and more bodies to clothe and shelter. Railroad building was curtailed almost to the vanishing point. The intemperate press and the intemperate politician clamored for rate reductions for the benefit of the common people, and every penny they saved to the common people by a reduction in railroad rates was paid for by the common people in the increased price of food, shelter and clothing to the extent of at least ten times, up to the time of the European war. It certainly would be difficult to figure the awful punishment the public got in more ways than one by an inadequate railroad system since the outbreak of the war. Owing to the lack of opening new lands by the building of railroads a situation came about that would have prevented us from feeding our allies and ourselves had it not been for the development of the automobile and the petroleum business.

The substitution of the internal combustion engine for animal power made available vast acreage upon which to raise food for human beings rather than to raise food for work animals. Instead of raising corn to feed the horse we raised oil to feed the engine. The pipe lines which carried the oil from the fields to the refinery and often to tidewater relieved the strain of our railroads. Picture if you can the situation we would have been in without oil and without motors.

The public has been universally imbued with the idea that brains and capital could only be made to serve them properly and economically when subjected to Government regulation. They lose sight of the fact that the best things that have been accomplished by the combination of brains and capital have only been made possible by the possibility of huge rewards, and that human nature is such that the mere possibility of achieving the rewards is sufficient in some instances to secure greater service to the public at a lower cost than could be secured by the most intelligent regulation. For instance, an investigation will satisfy

any thinking man that for several decades more money was expended for the search and production of gold than the entire value of the gold produced. The huge reward realized now and then brought more service from brains and capital than any form of regulation could. In my opinion what was true of the gold production business has now become true of the oil production business: that more money is now spent for the production of oil than the entire value of the oil produced. I have been surprised that almost every time I have made this statement some one has contradicted it on the theory that men with money to invest will certainly not put it into anything where they know that the total losses are more than the total profits. I do not think there would be any difficulty in demonstrating that this is true simply as a matter of psychology, but there is no need to speculate on this matter when we can point to the lottery as a complete demonstration of man's reasoning, or lack of reasoning.

Everybody knows that the total amount paid into a lottery is less than the lottery in turn pays back to its ticket holders, but human nature is such that the great mass of mankind will risk a small amount of money with the hope of winning a large amount, even though he knows that the odds are greatly against him. The lottery is so alluring that it has been almost impossible to suppress it even by law in many countries, and I would not be surprised if even at this day and age lotteries on a huge scale are flourishing throughout the United States.

Reverting for a moment to the railroads, the benefit to the public was in securing this railway service, and this they received and were getting in constantly increasing amounts up to the time the railroads were subjected to antagonistic and drastic regulation. The entire benefits received by every one who ever gained a penny of interest or a penny of profit or a penny of compensation of any kind through the building and operation of these roads were as nothing compared to the benefits received by the users. The increased value of the land adjacent to the railroads was in most cases alone more than the entire cost of the road.

The fight against business throughout the country has always been directed toward curtailment of profits rather than toward securing good and cheap service to the public. Let us hope that the day is not far distant when Government regulation and the

attention of the people will be directed toward benefit to themselves, not for the curtailment of somebody's profits.

The public often does not object to paying 25 cents for a pint of spring water, perhaps within 25 miles of the spring. Probably the spring was never drilled, its source never dries up but is continually fed by the rains and filtered by natural means, yielding a pure product. The oil man must go two thousand or more feet into the ground, dig up and procure mud which we will say is 15 per cent gasoline, transport it possibly for 1,500 miles, and then is criticized for fixing a price as much as 25 cents a gallon, which would be only little more than 3 cents as against the 25 cent price for the pint of spring water.

There are two things which must govern the price of any service or commodity, and these things fix the boundaries within which the permanent price must lie. The price must be above the cost of production or rendering the service, or the service will cease. This is what might be termed the minimum sale price, but we have already seen that an industry as a whole is often willing to take part of this sale price in the form of hope, which perhaps is never realized. The upper limit, the other thing which must determine the price, and which fixes the upper boundary, is the value of the product to the ultimate user. The people, however, seldom think of what the value of a commodity is to them, and insist that cost of production alone shall govern, and, as has been the case with many of our railroads and many of our public utilities today, they will refuse to pay even the bare cost for the commodity or service. The street railway situation throughout the United States is a proof of this.

We hear much talk about the high cost of living. We don't hear enough about the high cost of folly. The treatment of our railroads is a good example of the high cost of folly, and I wonder if we are going to repeat this with our public utilities and perhaps with all other industries by Government interference and restrictions.

The foundation plan of every business must be the giving of service at less than its value to the user, and it is astonishing some times to figure out the enormous benefit the user gets as against the producer. It seems ridiculous when this comparison is made that the user should have complained. It is not so easy to make direct comparisons between oil and other substitutes.

In many cases there is no substitute for oil, but I can make one illustration which gives entirely too low a value for the benefit the user receives, but offers a chance for comparison. Of the cities and towns of the United States supplied with gas, more than 50 per cent are supplied with natural gas. This would not be possible except for the oil industry. The exploration for gas and the drilling of the gas fields is largely the result of oil operations. In the search for oil natural gas may be found, we will say, 100 miles from some city. The city has heretofore been supplied with artificial gas at \$1.00 a thousand. Two feet of natural gas will do the work of more than three feet of artificial gas. Under pre-war conditions it was not uncommon for us to organize the capital for lines to the cities and supply the customers with natural gas at 30 cents a thousand. Gas heretofore cost the customer \$3.00; viz., 3,000 cubic feet of artificial gas at \$1.00 a thousand; he was now supplied with 2,000 cubic feet of natural gas at 30 cents a thousand, or a total cost of 60 cents, so the customer was benefited to the extent of \$2.40. The capital and the brain had to make whatever they got out of the 60 cents, or in other words, instead of the 50-50 basis the natural gas came in on the basis of 80-20, the customer getting the 80 per cent benefit without risk, thought or labor. It was not long, however, until in many instances the newspapers and the politicians told the customer that he was being overcharged. In many cases the natural gas companies today, who have exhausted their fuel and have to go to more distant fields and are handicapped by the increased expenses of operation, are denied any portion of the 80 per cent of benefit which the customer received.

Much of what I have said to you will strike you as being no more the problem of the oil business than any other business and my answer is that this is true, but in turn it is the duty of the oil industry to put business right before the people of the country, just as much as it is the business of any other industry. There are, to my thinking, reasons why it is more necessary for us to have favorable business conditions than it is for other lines of business.

I have pointed out that the campaign against the railroad companies was a commercialized campaign to build up the circulation of newspapers and to promote the career of ambitious politicians. The same thing has been true of the oil business,

perhaps even to a greater extent. I doubt if there is a man within the reach of my voice that has not at some time or other been publicly insulted, denied common justice, or subjected to insult by the accusation that he was trying to do something wrongful when he was not, or was accused of trying to pull chestnuts out of the fire for the Standard Oil Company, or in some other way the Standard Oil Company's name would be dragged in again to recapitalize the running fight with a lot of sensation-mongers, which was a commercialized campaign for years. I hold no brief for the Standard Oil Company, nor do I want to be whipped over their back, nor am I willing to see the whole American oil industry handicapped and crucified by this wornout wolf cry of Standard Oil Company, based largely on exaggeration and antiquity.

I am an independent oil operator in all that its name implies. Many another man has masqueraded under the name of independent oil operator that in plain, honest language was nothing in the world but a blackmailer. He was in business to be bought out, and, never having learned the rule of honesty among politicians, he would not stay put if he was bought out. We cannot judge the business ethics of one decade by the ethics of some previous decade.

If prize fighting should be made as much of an issue as business can be made, I can see some wonderful oratorical possibilities in the fact that John L. Sullivan beat down his many opponents to the point of insensibility with his bare fist, and under the influence of a great oratorical power the audience would forget entirely that the other fellow used his bare fist too. Business has progressed in much the same way that prize fighting has progressed. A prize fight would be vulgar now if fought with bare fists, but business used to be fought with its bare fist, and on the whole I don't know that prize fighting has been morally debrutalized by the use of gloves, and I don't know that business has been morally debrutalized by the use of gloves. It just satisfies the public a little better. Those who beat up a business opponent now smile and exchange cigars, instead of swearing and pounding the table, but the net result is about the same. It is more a matter of better manners, rather than better morals.

Between blackmailers and stock jugglers the oil business has been greatly handicapped and given to many an unpleasant

odor that does not readily wear off. The men who gave this odor to the oil business in almost every case were strangers to it, blackmailers on one hand and gold brick men on the other. If blackmailing had paid better in the newspaper business they would have been starting up rival newspapers to be bought out. If selling gold mining stocks on salted ground would have paid better than oil stocks on barren ground, or no ground whatever, they would have been in the gold mining end of the business. The blackmailer is largely a thing of the past. The fraudulent and would-be fraudulent oil stock seller are the one thing that even in war times we never got rid of.

If the Standard Oil Company ever dreamed of a complete monopoly of the oil business, that dream must have left them a long time ago. In my opinion the brains required to run their business could never have tarried this long with the idea of a sustained monopoly. They must have known that competition was inevitable and on a huge scale, and you don't have to go beyond the brain process to see what would occur if any man knew competition was inevitable. What any of us would do in this case would be to try and drive out unfair competition and competition that was unwilling to bear its just responsibilities and burdens of the industry.

The oil business of this country is now, and has been for a long time, a highly competitive business; in fact too much so for the good of the public. We have another factor to reckon with and that is no small one. The oil business is no longer a local business; it is international. Here is an industry that by right of discovery, development and conscientious work is largely of American origin and parentage. The position acquired by the American oil man is now contested by the oil men of every other country. If, until the last few months, our Government reached out to give any sort of a boost to the oil business, I never heard of it. Our largest and most powerful oil company, and the one that could contribute the most in maintaining American supremacy, was heaped with abuse until it was tarred with unfavorable public opinion and finally hamstrung by a court decision which largely emasculated it, while its big foreign rivals were left free to conduct themselves according to their own sweet will. While all foreign oil companies can depend upon at least the unqualified moral support of their Governments, and in many cases their

Governments have gone down into their pockets and furnished them with Government money assistance, all that we can hope for is to keep from being hamstrung by our Government until we can make it appreciate what it means for the American oil companies to maintain their position in the world's competition for oil.

So to those who may criticize some of the things I have pointed out as being common to every kind of business and not simply to the oil business, my answer is that we have many special problems to meet. I know of no industry today which faces the need for greater capital, and I know of no business where so little foundation has been laid for getting this capital—in fact where so much harm has been done in poisoning the public mind on the safety of oil investments.

The matter of floating oil investment stocks on the market was practically an unknown thing up to four or five years ago. The growth of the business was not so rapid and was easily taken care of by the reinvestment of profits. The usual vehicles of finance used by other lines of business, such as bonds, preferred stocks and debentures, were almost unheard of in the oil business, and only in recent years have they been offered as a popular subscription to the public. Where bonds, preferred stocks or debentures were used they were largely used in lieu of purchase money. While other lines of business have worked out not only the nature but the amount required for the various safety features required for bonds, this has all yet to be done in the oil business, except as we may here or there suit the fancy of some single banking house. The matter of drawing sinking funds for bonds on oil properties, the amount and how it shall operate, the clauses relating to maintenance of property, the terms under which additional bonds can be issued, and all matters of that sort are questions demanding future invention as to nature and determination as to amounts.

Thinking people are seldom impulsive and are generally exceedingly cautious.

—HENRY L. DOHERTY.



HENRY L. DOHERTY
1922

The year 1922 showed a marked improvement in all Doherty companies. The organization suffered an irreparable loss in the sudden death of Frank W. Frueauff on July 31, 1922. Mr. Doherty resumed a more active part in the direction of the affairs of the organization and was called upon to make a number of important addresses. In an issue of Hi Voltage, the employes' magazine of the Empire District Electric Company, Judge D. D. Hoag wrote the following tribute to Mr. Doherty:



FIRST met Henry Latham Doherty in 1909 in connection with the sale of the public utility properties of the Consolidated Light, Power & Ice Company to the Doherty syndicate. The negotiations leading up to and the final consummation of the sale were characteristic of the man.

He made an exhaustive study of the conditions of the district from an engineering, geological and business standpoint, and reached his conclusions as to its possibilities for future growth and development. He wrote a letter outlining in a broad way his plans for the upbuilding of a larger property, and in that letter indicated his idea of the value of the property as it then existed. The offer as made was accepted by the representatives of the Consolidated Company and that property in due time became the foundation of The Empire District Electric Company.

This is an example of his direct methods and is in marked contrast with the practices that usually obtain in the acquisition of similar properties.

In the management of his public utility properties, Mr. Doherty has adopted the policy that the good will of the public is one of the greatest assets a public utility corporation can have. As a result of this policy it is found that the public has been served and the stockholders have had a fair return upon their investment. He has rendered the public great service by sub-

stituting the policy of frankness and courtesy for the old arbitrary attitude. The Doherty Training School is a product of his brain. In the education of these men, Mr. Doherty has been the leader and teacher, believing and acting upon the principle of "helping others to help themselves" to right living and straight thinking. Mr. Doherty is self-taught and he is well grounded in a practical knowledge of the sciences. He has applied scientific principles to business practices, as evidenced in the numerous patents and important discoveries that he has made. His broad vision, courage, and constructive imagination are manifested in the training of technical graduates for special work. His application of scientific methods to the subject of rates for public service has provoked much discussion, but the fact remains that the New York Court of Appeals and forty Public State Commissions have approved the plan demonstrates the correctness of it.

He has contributed to a large extent to research and practical work in behalf of humanity.

He has a wonderful genius for organization as evidenced by the acquisition and amalgamation of the properties that constitute the Cities Service Company.

He has a remarkable capacity for hard work but he has been wise enough to take sufficient recreation to keep his body and mind refreshed. He has a philosophy of optimism which admits of no defeat and embarrassment. His keen sense of humor keeps him in sympathy with his fellows. As a friend he is one of the most lovable of men.

He teaches his men to think for themselves and allows them wide latitude and discretion in the conduct of business. He believes and teaches that men who work together must give each other sympathetic assistance and strive to be friends. He practices and preaches consideration in appraising mistakes; he encourages every kind of research; he conscientiously urges every man in his employ to fit himself for a more lucrative position; he utilizes every old and several original methods to develop thrift and habits of investment among all people who come within his influence.

With Mr. Doherty no practice nor method shall be considered entitled to the name of Standard, so long as there is a possibility that any improvement may be brought about in it.

In negotiations where the public is involved and where the negotiations were started in an unfriendly spirit by the representatives of the public, the final outcome has been that Mr. Doherty's integrity and earnestness and honest desire to give proper public service, have won for him the personal friendship and confidence of the men who were opposed to him.

He has reached a point in his career where he is now the largest public utility operator, and is one of the greatest leaders in the production of oil and gas, but he is still the same quiet, simple man that he was in his earlier years.

Don't simply try to convince your wife and family of what a wonder you are by conversation, but rather direct your energies to doing something so the boss will know what a wonder you are.

—HENRY L. DOHERTY.

Early in 1922 the Electric Railway Journal interviewed Mr. Doherty on the general public utility situation, and editorially characterized him as "a successful public utility operator, a leader in business thought and practice, who has never lost the human touch and sympathy." In the interview, Mr. Doherty said:



HE public utility business certainly got a wallop through the inflation of prices during the war. The prices for commodities and labor advanced so rapidly that no business could keep pace with them except those which were free to advance their own selling prices at will.

It was believed by many that the credit of public utility undertakings if not permanently ruined was at least permanently crippled. However, it has been demonstrated in the first wide spread investment market since the close of the war that public utilities are back in favor, and as a whole they again enjoy credit second to no other business securities. Public faith was shaken but not shattered.

There was really never anything intrinsically wrong with public utilities. When other lines of business get into trouble it is due to other causes than inability to advance their own selling price. Generally it is because something else has come along to take its place which the buying public prefer or which can be furnished more cheaply. The public utilities were at all times capable of furnishing service to the public at less than its value to the public and yet at a price high enough to pay their own expenses and fixed charges.

The street railways were hit the hardest, the gas companies next, and the electric companies the least.

Nothing has come along, however, that can either displace these services or that gives any promise of doing so.

A street railway, propelled by electric power, generated at a central station, running on steel wheels and on a steel track, can give service with a high density of traffic at a cost so small compared with the gasoline driven vehicle running on rubber tires that the latter is not within hailing distance of it.

When I look back on the public utility business I wonder that it has not had more trouble than has ever come to it. The basic economic problems which underlie nearly every form of public service have never been understood by a large portion of the public utility operators, and have been totally disregarded by most of them even though they have been understood.

Perhaps when I start here to talk again on some of these problems some of my audience will want to leave the room, for I am going to take you back and restate many of my views which I stated, to put it dramatically, during the previous century. I will try, however, so far as possible, to give novelty to my views by at least trying to adopt modern nomenclature.

First of all we must recognize that we are giving a service and not simply selling a commodity; that equity of charging is more important than simplicity of charging, and methods of charging which can only be justified on the grounds of simplicity can be economically so unsound as to at least seriously handicap the business, if not ruin it.

From a frequent and voluminous talker on public utility problems I subsided for a good many years. Many of the views that I believed were sound were at first flatly rejected. None have received the support they deserved until quite recently.

The readiness-to-serve method of charging, which is now better known as the three-part rate, was presented at Chicago in May, 1900, before the National Electric Light Association, and I think before the American Gas Association the following year. It was my intention to present each year, either by myself or through some of my assistants, a further paper dealing with refinements of this method of charging—this being a practice that I had used regarding other matters, as exemplified by the report each year before the Ohio Gas Light Association on bench fuel economies and the report each year before the National Electric Light Association on lost and unaccounted for current.

The gas fraternity practically to a man rejected the readiness-to-serve method of selling as being inapplicable to their business; but I was greatly pleased, and also surprised, when a group of prominent gas men, discussing the serious problems of the gas business in May, 1921, finally passed a resolution, without a dissenting vote, endorsing the readiness-to-serve method of charging and advocating that the principles involved therein should never willingly be departed from, and any departure from this method of charging should never be made except as a compromise. This has encouraged me to again talk and write at times upon the problems of the public utility business.

As some of you probably know, I have resorted at times to the use of publicity campaigns to make the public understand the problems of one or another local companies. I do not know whether I was the instigator of this type of campaign or not. At different times, however, I have had many inquiries from many different companies describing their situation and saying: "Under these circumstances would you advise a publicity campaign?" In almost every case I have had to say in reply: "Show me your copy and I will then try to answer your question."

It seems to me that the public utility men have seldom used their best and most convincing arguments to get fair treatment from the public. It is surprising how short the public's memory is, and still more surprising how short our memory is.

It has only been a few years since public utilities were indiscriminately subjected to competition. After many decades the public concluded that it was a sufferer by this competition, and then solemnly resolved that best service at lowest rates

could be had for the public by doing away with competition, and the public said: "You by natural laws should be a monopoly and we are going to make you one in fact, but if we do this we must regulate your earnings." We accepted this because there was nothing else we could do, and the fashion swept across the country of passing regulatory bills and creating public service commissions—and yet this work was hardly under way before the street railways of the country were subjected to the rottenest and most unfair form of competition.

The expenses to us in being "ready to give service" are always present, although in some lines of business like the street railway business it may be hard to charge on a readiness-to-serve basis. Giving service here consists in having a car come down the street every 5, 8, 10 or 12 minutes whether anybody is there to ride or not, and the men in the outlying districts who wants to take a train at, say, 10:30 at night knows that he can go out at a certain time and catch a street car and get to the station.

If we were to simply run our cars carrying no passengers whatever but being ready to give service, our expenses would probably be 80 per cent of what they are when carrying passengers, so in a way 80 per cent of all the expenses of a street railway are readiness-to-serve expenses and 20 per cent are represented by the carrying of passengers.

How to apportion these readiness-to-serve expenses among those that are benefited is a difficult matter, although there are ways by which regular and frequent passengers can be premiumized. Some of the railroads are using an identification card which gives the holder a lower rate than the prevailing rate of fare, charging a fixed amount per month for the card. This means a fixed charge plus a low rate of fare.

Passengers transportation is a necessary part of our city life. It could even be argued that it was a common expense which all property owners should bear, and I have suggested on one or two occasions that it would not be inconsistent for the public to pay a part or even the entire readiness-to-serve expenses of a street railway company, raising such a fund by a property tax.

This is not the proper place to go into details, but I might take an example of one of you gentlemen who lives in the outskirts of the city and uses for your own transportation auto-

mobiles exclusively; nevertheless, much of what is necessary to maintain your home depends upon street railway service, not simply for the errand boy and your home servants, but for many other things.

Along comes the jitney, and the public forgets all about the fact that we have had all profits above a nominal rate taken away from us for a period of years on the theory that being a monopoly we were not entitled to anything more than a meager rate of return, and so we are again thrown into competition and yet our competitor bears none of the expenses of being ready to serve the public. Our competitor simply carries passengers when it pays to do so. The taxpayer provides his road and cleans his streets, and yet he takes enough of the cream off of our business to perhaps make the whole undertaking unprofitable. The lesson once learned by the public has soon been forgotten. We have paid the price for immunity from competition only to find that we did not even have a sound crutch.

Then, again the public have always been imbued with the fact, and are yet, that when we are allowed to earn a certain rate of return that that is equivalent to being guaranteed a rate of return. This is one of the exceedingly unfair features of regulation as now practiced, because we are guaranteed nothing except that excess profits will be taken from us and that we will be left to bear our losses alone.

In most cases excess profits, instead of being reduced by lowering rates, should be used to reduce the relation of capital to property values, perhaps even to the extent of bringing the capital down to the junk value of the property.

The street railway men have had pointed out to them repeatedly, not only by me but by others, that they could not expect to go on extending their roads, giving universal transfers, and perhaps finally getting where, to illustrate by exaggeration, they would be carrying people from New York to San Francisco on a 5 cent fare.

I have always been an advocate of a distance system of charging with a fixed loading and unloading charge. That is, a small charge to represent loading and unloading with a fixed charge per unit of distance of riding. I have always been told that such a system would be impractical, but I see no reason to think that it could not be worked out in a very satisfactory

way, except for lack of interest on the part of street railway men.

In the old days I was always regarded as a pessimist on street railways, and I guess that is true, for we have no street railways that were not acquired for specific purposes other than the expectation of making money out of the road itself, and I have never felt that our interests were enough involved in this matter to endeavor to pioneer the whole problem of an equitable method of charging for street railways. My work in the other branches of public utility work on methods of charging did not whet my appetite for more work of this same type in an additional field.

While practically every electric company in the United States uses the readiness-to-serve method of charging, or the equivalent of it, there is practically no city in the United States where it is universally applied to all customers.

The flat 5 cent fare has worked, to my mind, not only harm to the street railway companies but harm to the public as well.

The meager transportation facilities in many of the European cities, which, however, seem adequate, can only be explained by the fact that anything in the nature of a distance system of charging tends to enormously increase the capacity of the transportation vehicle by encouraging short rides, and this in spite of the fact that many of the European zone systems are hopelessly faulty.

A proper system of distance charging would tend to keep the workman who is employed in the suburb living in that same suburb instead of having him perhaps cross the entire city to reach a district settled by his own type of people. It would also cause people to do more of their shopping in their immediate neighborhood, and would give us the very desirable thing in civic life of less congestion and yet less transportation demands.

There are many minor reforms I recommend in the street railway business that I will not take up here.

By the way, as I have told you, I have always been pointed out as a pessimist on street railways, and it may amuse you to know that I am now regarded by many street railway men as an optimist on street railways. Personally, I do not think I have changed my position very much, if at all, but I am certainly more optimistic than many of their former champions.

One thing we do need in the public utility business, no matter to which branch it relates, is an empowering act enabling the public service commission to fix an initial rate for a long period in advance and then permit the company to earn all it can over what is now considered a reasonable rate of return, with the provision that these earnings shall be divided between it and its patrons. This is done, in a measure, by the South Metropolitan Gas Company of London, and is known as the London sliding scale and was initiated, I think, by Sir George Livesey; but, in my opinion, the profit sharing with the patrons, wherever possible, should be done as a declaration in dividends rather than in the nature of a lowering of rates from time to time.

In the electrical business the readiness-to-serve method of charging should be universally applied to all customers, and they should be limited to the demand for which they pay. Many of our present electrical customers are unprofitable and the losses experienced on these customers must be made up from other customers.

If what the electric company now gets as a whole was received by it in the form of a fixed charge and a charge for energy, and the making of the fixed charges would enable the charge for energy to be reduced one-half, it would lead to an enormous utilization of energy, permitting the public to constantly be served at a lower and lower cost.

I think most of the electric companies learned the folly during the war period of not inserting a clause providing for a change of rates with a change in the cost of coal. These clauses should be embodied as far as possible in commission fixing of rates, with permission to immediately change the rate with an advance in the price of coal.

The wallop the gas men got during the war period has made me a great optimist on the gas business. We have been handicapped in the gas business by working under standards created for another day and age and having no more application to our business of today than rules for a horse car line would have to do with a modern street railway.

The gas business was founded originally solely to furnish illumination. The only means of getting illumination in those days was by the use of hydrocarbons, breaking the hydrocarbon

in the flame and trying to maintain the carbon particle in a state of incandescence as long as possible without burning it to its gaseous products. Many decades ago incandescent gas lighting was developed, and in fact perfected to a state where people could not afford to burn gas in an open flame. Nevertheless, in many cities and in many states candlepower standards are still in vogue. Every place a B. t. u. standard is specified it is so high that it can only be met by having a generous amount of hydrocarbons present. At first all B. t. u. standards were fixed at about 600, but here and there the standards are being changed by the "cut and feel" method, and if there has been any attempt to determine what this standard should be, based on a true analysis of facts and arrived at by a mental process which maps out the road by which the goal was reached, then I am unacquainted with this effort.

Practically all of our gas is now sold for fuel purposes. None of this gas is fit to be burned for fuel purposes in the ordinary house appliances, except by first diluting it. Nonluminous gas such as mixtures of carbon monoxide and hydrogen would give equal or better performance for every use to which gas is now put.

All of our gas is now made either by the destructive distillation of coal or by first making blue water gas and then enriching it. This is an awful waste of good material and a needless drain on our oil reserves.

In 1911 I pointed out to the Royal Automobile Club of Great Britain and to some of the public officials that if all of the gas made in the United Kingdom was made from coal and then scrubbed to recover the condensible oils, that the United Kingdom would not have to import a gallon of petrol and could more than supply all of the petrol demands from this supply of oil, and which as a vapor in the gas had no greater value to the gas consumer than an equal number of B. t. u. in the form of blue water gas. In 1913 I again took this matter up in England, and everybody seemed strong for it except the gas people. Many of them said it would not be practical. Some of the papers poked a lot of fun at me. However, after the war broke out they had to accept my recommendation, and it was so successful that they have since provided by law so the practice may be continued.

The gas companies have for years carried large numbers of consumers on their books at a loss, but so long as they could be generous at the expense of their profitable customers they did not appreciate the need for equity. When the unprofitable consumer became a burden to the gas company which could not be shouldered onto the profitable consumer a great awakening occurred regarding the evil of inequity.

Given the right to apply the readiness-to-serve charge universally to all customers, and given the right to make whatever character of gas is available from the raw materials at hand, with no restrictions except to give a gas which will perform equally well with the present gas now supplied, and to charge on an energy basis for this gas, and there is no question in my mind but what the gas companies can substitute gas for all solid fuel in the home.

The failures that are pointed out in the attempts to supply fuel gas are not even worth an investigation as to what they prove by their failure as seeming to show that gas cannot be substituted for solid fuel. In my opinion, none of these schemes, no matter how perfect they may have been in other ways, could by any chance have succeeded except by the use of a demand system of charging.

Often the man who ought to be really merited has too much modesty to make his work stand out.

—HENRY L. DOHERTY.

One of the largest news syndicates asked Mr. Doherty to prepare a short article on "What to Do If You Would Enter the Public Utility Business," in 1922. He wrote:



ON'T play the other fellow's game!

The valuable man to any company is the man who can do a thing better than any one else, or who can do a thing that no one else can do. Too many men neglect a careful study of their own line of work because they are more interested in something else.

Baseball is a fine game, but if I have a salesman who is an up-to-the-minute authority on batting averages and fielding

records during and even after business hours, I know that he is more interested in baseball than in the sale of our securities.

There are lots of employes who, although intelligent, studious, and in some instances even brilliant, never get very far. Their troubles are various.

In one instance such a man's stumbling block was theatres, not so much seeing plays as the devotion of a great part of his spare time to picking up the patter of the profession and its personnel. He wasn't in the theatrical producing business and the effort he was expending certainly would not offer him any opportunity for capitalizing it.

It is the man who studies the work he is doing, the man ahead of him and his work, and fits himself to move up when the time comes, who wins success in the utility or any other business.

A great deal of time can be wasted in discussing political campaigns. The same amount of energy used in such a discussion could well be applied in studying the problems of the business in which the individual who discusses politics is employed.

Such a man may make a very convincing argument as to why one candidate should be voted for in preference to another, but after the election is over he finds little opportunity, unless he is a professional politician, to cash in on the work he has done.

Probably the worst enemy of success nowadays is mental laziness and conceit.

If a man is mentally lazy, he will not think any more than he has to, and if he is conceited he would rather have his wrong opinion go unchallenged than have it corrected.

Dishonesty in business is intolerable. Many men have gone down to failure who, while they agreed generally that honesty was the best policy, considered it shrewd when they were dishonest in some minor business detail.

Never worry along in a job where you are dissatisfied. If you are dissatisfied, something is wrong somewhere. The trouble lies either with your boss, his boss or yourself. Locate the trouble, put a pin in it, and then be guided by circumstances and use common sense.

One thing for the college man who has just entered business to remember is that all of this talk that the rich are getting

richer and the poor are getting poorer is plain bunk, and that the basis for individual success is thrift.

The man who saves a portion of his income is putting down a bed rock foundation upon which any structure he is capable of building will safely stand.

Don't be a spendthrift and don't be a miser, but if you must be one or the other it is better for both yourself and your fellow man to be a miser.

—HENRY L. DOHERTY.

At Yale University Mr. Doherty was invited to speak before the Connecticut section of the American Institute of Electrical Engineers. The address was extemporaneous, and was reported in the New Haven Courier Journal as follows:



THAT public utility companies cannot prosper under too much regulation, that an equitable rather than a simple rate for service should be sought; and that good times are ahead, were some of the conclusions of a lifetime spent in the gas, electricity and street car industries by Henry L. Doherty, President of the Cities Service Company of New York, in an address to the Connecticut section of the American Institute of Electrical Engineers last night at their annual banquet at the Taft.

Some hundred engineers were present. At the head table were President James R. Angell of Yale; President Lucius S. Storrs of the Connecticut Company; Prof. L. P. Breckenridge, Calvert Townley, formerly Vice-President of the New York, New Haven and Hartford Railroad; E. H. Everett of the Southern New England Telephone Company, who at the business meeting was chosen President of the Connecticut section, and Prof. A. E. Knowlton, Secretary. Prof. Charles F. Scott, retiring President, presided.

MOST PROGRESSIVE OF INDUSTRIES

Mr. Doherty said what President Angell confirmed in his remarks later that electrical development outran all other lines of industry. The war had hit public utilities hard but they are now back in favor. He was convinced, he said, that the street car running on metal rails cannot be displaced by any gas propelled

rubber tired vehicle. Mr. Doherty dealt with methods of charge for service, having much to say of the "readiness-to-serve" plan.

Mr. Doherty thought utility companies have much to learn of publicity campaigns. The present attitude of the state: "You are a monopoly; we will make you one in fact, but we must regulate earnings" does not please the speaker. "We are guaranteed nothing; if we make profits, excess profits taxes take them; the deficits are ours." As for street car fare, the speaker inclined to a small charge for loading and unloading plus a distance charge. It is not simplicity of charge so much as an equitable charge that should be insisted upon.

A flat five cent fare harms the companies and the public, Mr. Doherty maintained. Lowered dividends rather than profit sharing with the public were favored. The gas industry was also discussed. Given the right to make profits without regulation, and the companies can furnish gas to displace all solid fuel in the home. To hamper utilities means that capital will prefer other industries for investment, the public being the loser, he said.

When you read something that will benefit you, read that which will benefit you the most.

—HENRY L. DOHERTY.

When questions of business development are under consideration in the oil or public utility field Mr. Doherty is one of the first men sought. At the 1922 convention of the National Electric Light Association, Mr. Doherty was asked to speak on the broad subject of "The Electric Light and Power Company." He said:



It has been a long time since I appeared at a general session of this association, and I am particularly glad to appear and talk on a matter of business development. I see many of my old friends in this audience and am glad to be here again. I have thought it wiser to write my few remarks which I am to deliver this morning, because many of you can remember the time when in arising I said that I would make a few remarks and summarize my paper, and then I talked a good deal longer than if I had read the written address. What I have to say is as follows:

You all hear the bromide expression frequently that "electricity is only in its infancy." The truth of the matter is that electricity today is the best developed science we have, but the science has been developed in all of its various stages so rapidly that it can truthfully be said that the applications of electricity in relation to opportunities are still in their infancy.

What is needed is a joint sales effort and still more joint sales effort, and it will be true for many years to come that the engineers can point out an actually developed apparatus for the application of electricity faster than our sales efforts can realize upon these opportunities.

I, as a business man, am one who thoroughly believes in that calling. As a business man I have never felt I had to blush for being a business man. In fact, I like to think of business as what it really is in many cases, a philanthropy. Every sound business proposition is based upon the fact that it supplies some service or commodity to its customer at far less than its true value.

There are natural limits that fix prices. The lower price is limited by the cost of production. Nothing can be sold permanently at a price less than its cost of production. The higher price is fixed by the fact that nothing can be sold above its value to the user. Between these limits the price must lie and almost universally the price is fixed only slightly above the cost of production, regardless of how great the value may be to the user. Big business cannot haggle and bargain, but must serve all at a published schedule and serve all at the lowest possible cost. We go off, we will say, and build a waterpower plant in some sparsely settled portion of the country and carry energy to the nearby markets, supplying energy in many places which have never had central station service before. Perhaps many of the power users in these districts have been generating power at a cost of five or six times what we charge them and these people start out with a dividend from our business of perhaps five-sixths of their entire previous cost for power.

You can take the same example in the building of a railroad and show where many a user of that railroad saves more over his previous cost of transportation than the entire gross amount he now pays to the railroad. We men in the oil business occasionally strike a field of natural gas. In the pre-war days,

when gas was frequently sold as low as one dollar a thousand feet we would carry natural gas many long miles to a city and sell it to customers at thirty cents a thousand cubic feet. Two feet of natural gas will do the work of three feet of artificial gas, so our enterprise starts off by taking sixty cents from the customer and leaving \$2.40 in his pocket. Certainly these are huge dividends which the public reaps from business and which permits us, if we will, to point out the philanthropy of business. And is it not strange that many of these people who have received such huge benefits would later show a desire to quarrel with us if we happen to make good profits out of the relatively small payments they make to us, when considered in the light of the value of the service to them.

In my opinion, the great business successes of this country have generally been made by the men who have entirely lost sight of the money profit they would make out of business. The man who starts in business with the one desire to make money seldom gets very far, and many of them make awful failures. The great business successes have largely been achieved by the men who have loved the game. All men probably have sufficient altruism in their makeup to prefer to sell something valuable to the buyer rather than something that has no value, and, in my opinion, every salesman can work better if he thoroughly appreciates the fact that he is selling something to the buyer which is vastly more valuable to that buyer than the amount he pays for it.

From the standpoint of the central stations, whose object is to get the best appliances into the hands of their customers and who are not interested in competitive selling, we are in every instance doing vastly more in our salesmanship to benefit the public than the benefit which is realized by the company. The salesman becomes the agent to carry out the philanthropy of business which I have exemplified above. He has this incentive in addition to whatever other compensation he receives. The more he sells, the more cheaply the article can be produced. The greater the development of the use of electricity, the more possible it becomes to serve the sparsely settled districts.

Intensified salesmanship is cumulative in its good effects. Your work in salesmanship is making for a more efficient nation. If electrical service is used for any purpose in one house or one

factory, why stop until it is used in every house and every factory? I have said for years that whenever you see a man, woman or child doing any work, any kind of manual labor, that electricity can either do that labor, lessen that labor or contribute to the comfort of the worker. Some day we will study every bit of human labor that is done with the idea of applying electricity as an aid thereto, and I hope that the inauguration of this joint sales effort will soon reach that point.

The people always want to see fair play but they are sometimes woefully wrong as to what constitutes fair play.

—HENRY L. DOHERTY.

In a letter to the Public Service Commission of Pennsylvania in 1922, dealing with rates of the Lebanon Gas & Fuel Company, Mr. Doherty gave a comprehensive outline of the reasons underlying the three-part rate:



ENTLEMEN: We have given painstaking consideration to your order of June 13, 1922—in fact, almost prayerful consideration.

We are most anxious to comply with your wishes, and do not want our action in filing another three-part rate to be construed as other than a matter of necessity.

We are convinced that the recognition of the three-part rate is a life and death matter for the entire gas industry. The writer of this letter has been connected with the gas industry for nearly forty years, and has watched the inevitable trend.

The gas industry cannot continue to furnish a service and supply a commodity and yet hope to live charging only according to the amount of the commodity supplied. Not only this, but the gas industry must be allowed to fix charges corresponding to that which occasions the expense. This can only be done, in our opinion, by the combination of (a) a customer charge, (b) a demand charge and (c) a commodity charge.

Given such a method of charging, together with the establishment of rational standards, and the gas industry can continue to grow and expand and be an enormous factor in the promotion of business prosperity and domestic comfort. With a rational system of charging and rational standards I am confident gas can be substituted for coal and oil in many industrial operations to the great economy of production and can be supplied as the sole fuel for the home at less cost and much greater profit than by the use of gas for cooking and coal for heating and other purposes.

I have watched the encroachment of the electric business on the gas business for years, and know that this must continue to go on and that the gas business, if it intends to live, must in turn open up new fields.

I call your attention to the fact that the gas business was an old, well established business when the electric utilities were first conceived and that notwithstanding the numerous advantages which the gas business has, the electric business far surpasses it in the way of service to the customer and economic stability which is of primary interest to the stockholders but which is a necessity precedent to service to the community.

The gas utility was first in the field. The gas utility in any ordinary town serves at least ten per cent more customers than does the electric utility and such are the uses of gas that, providing the ordinary customer were limited to the use of the service of one utility and had his choice between gas and electric, he would take gas.

Notwithstanding these fundamental advantages, however, the electric utility has been able through periods of normal prices to constantly reduce their rates and still maintain themselves on a profitable footing, which is the exact opposite of the ordinary experience of a gas utility.

There, of course, must be some fundamental difference that is back of this situation. That difference, I believe, can be easily recognized by anyone who is willing to give some time to the comparison of the two utilities. The electric utilities were feeble in their early stages because of the fact that they started out with nothing behind them but the experience of the gas utilities and they attempted to sell their product on the basis of a flat meter rate equal to all customers. They very shortly found,

however, that if they were to lower rates for the purpose of adding further business they must get a system of charging which made each individual carry the cost to the company of furnishing service to that individual together with a fair margin of profit and no more or no less.

It is impossible for the gas business to continue to carry more and more customers each year at a loss and hope to be able to compete with other forms of fuel. If it must carry some customers at a loss it must then, if it lives, overcharge other customers.

The gas business can be developed by a recognition of the fact that there are three separate and distinct divisions of the cost of operating any utility. Those three separate divisions of costs have been, first, a Customer Expense. Under this class there have been included all of the costs which are identical for each customer irrespective of whether that customer makes large or small demands on the plant or uses a large or small amount of the plant's output. This includes such items as meter reading, bookkeeping, the fixed charges on services and on a portion of the distribution system. The first two of these items have been pretty generally recognized as is shown by the fact that there are customer charges approved by thirty-four public utility commissions in the United States. The latter item (the fixed charges on the services and on the distribution system) has not been so well recognized up to date. I would, however, call your attention to this fact. You can easily conceive an industrial plant using the total present output of the Lebanon Gas and Fuel Company in such a way as to have the present demands and consumption of Lebanon and you can readily appreciate in that case a distribution system consisting of one line to that plant would be totally unlike, and would represent only a small portion of the distribution investment now necessary to serve the City of Lebanon. If then serving 1,500 customers the same amount of gas with the same load factor which you could sell to one customer costs an added investment in distributing systems, there should be a charge made to each customer in addition to the consumption charge to distribute all costs and do absolute justice to individual customers.

You will note that I am not referring at all to the amount that this charge should represent, but only as to the method

which must be adopted to do justice as between customers as a whole and to the gas property.

The second division of costs has been classified under Demand Charges. A thousand customers using 2,400,000 feet of gas per day at the rate of 100,000 feet per hour would not necessitate a manufacturing plant more than fifty per cent as large as would be necessary to serve a thousand customers using 2,400,000 feet per day but using it from six o'clock in the morning to six o'clock at night. Here is a case where the same number of customers using the same amount of gas per day require a one hundred per cent increase in the investment. If each one in that group of customers was equally liable for the increase in the plant capacity; (something that would never be found in practical operation) you could distribute that additional cost to those customers by adding so many cents per thousand feet of gas sold. However, since some of these customers are responsible for this added investment and others are not, it is necessary to segregate the fixed charges occasioned by the investment in a plant of sufficient capacity to serve them all, and to apportion these charges as between these individuals in proportion to the demand each places on the plant.

The cost of serving a customer 10,000 feet of gas in ten hours per day is entirely different from the cost of serving one customer 10,000 feet of gas in two hours. The fixed charges on the plant necessary to supply the latter customer would be nearly five times as much. It is inequitable as between customers to distribute these demand costs in any other way except to apportion the total fixed charges among all customers in proportion to the demands of each without relation to gas consumption.

The third class of costs necessary to serve gas to the customer are the Consumption Charges. Having disposed of the customer costs which vary with the number of customers added, irrespective of their individual demands and their individual consumptions, and having disposed of the demand costs by apportioning them equitably between the customers as they create these demands, irrespective of the total amount of gas they consume, we have left only those costs which vary directly with the amount of gas consumed.

These costs which include coal, a portion of plant labor, etc., are within reasonable limits doubled when you double the con-

sumption and should be assessed to each customer in proportion to his individual consumption.

So far I have spoken only about the equity of distributing between customers by means of the three-part rate those costs of doing business. I now want to take up another question that is of primary importance to the consumer. No company, without adequate funds to provide for maintenance and operation and without a profitable operating statement that will make it possible to secure funds for extensions and betterments, can satisfactorily serve a community.

In some cities—of which Lebanon is one example—we have already reached the point of diminishing returns, and there would be no rate which we could charge based entirely on the amount of the commodity used that would earn us a fair return on the investment; and there is no method of charging, in our opinion, other than the three-part rate which will enable us to grow and expand and eventually bring down the cost of service to the public as a whole, to the point where gas can be substituted for solid fuel.

It would be as impossible for a hotel to formulate an adequate system of charging if every guest were allowed to reserve as much or any part of the hotel as he wished and yet was charged only according to the food he ate. The hotel must charge for the amount of their plant which is used by the hotel guests *plus* the food that he eats.

Except as the three-part method of charging is permitted I am afraid to invest more money in the gas industry, while, on the other hand, I have not the slightest fear of carrying the gas business on as it was prior to our entrance into the war in addition to carrying it on in a much broader and sounder way, laying a sure foundation for safe and permanent investment and contributing to the public service that can be had in no other way.

There is no logical step from the former method of charging, which was purely on the commodity basis, except the full adoption of the three-part rate. As I have previously stated, we have already reached the point of diminishing returns and no rate on a strictly commodity basis will enable us to realize a fair return not only on the money already invested but on that which must hereafter be invested as the city limits are extended.

It is, in my opinion, just as unconstitutional to enforce a method of charging that prevents a fair rate of return as it is to fix prices so low that the property cannot by any chance earn a fair rate of return.

We are installing the three-part rate in the various gas towns in the United States with the firm belief, founded on years of experience, that we can under the three-part rate supplant every other form of heating used in the homes of the average city.

We have had in Lebanon sixteen months' experience under that rate and for the first time in the life of the Lebanon Company since 1906, we have a net earning that would justify extensions and betterments to the Lebanon plant and would justify the attempt that we had expected to make to supplant other fuels with artificial gas. The present cost of artificial gas is due to the small consumption and the poor load factors the customers show due to the compelling influence of high flat meter rates charged and to the high manufacturing costs caused by the enforcement of standards set when gas was consumed for purposes and under conditions that have long since disappeared.

I see no reason to believe that if the three-part rate is allowed to continue and rational standards set we cannot begin supplying heating facilities to the inhabitants of Lebanon, nor do I see any reason to believe, that when we begin to take on heating we will not get a load factor and consumption which will so reduce our costs as to enable us to take on more and more business at lower rates. The circle of high rates and lower consumption which again induce higher rates is a vicious one which has ruined many companies and in turn deprived the customer of that sort of service to which the customer is entitled. With the three-part rate the long hour user for whom gas can be manufactured with a proportionately small investment is given the advantage of the economy which his methods of use made possible and he is induced to use more gas. The company under the supervision of the public utility commission can earn only a fair return and when these economics are reflected in reduced costs of operation they will, of course, be passed on to the customer.

It is my sincere hope that we may be allowed to go into the actual operating results of the sixteen months' three-part rate experiences in Lebanon in conjunction with the City Engineer and with the Commission and that we may be allowed to demon-

strate the fact that under the three-part rate there was an equitable distribution of costs first, and that secondly there was an inducement offered for additional consumption of gas, which under normal conditions would increase our business to a point where a reduction of rates could be affected.

Knowing these facts can be proven and feeling, first, that any other decision would be against the interest of the customers and that, second, it would react against the interests of the company, I am regretfully forced to disagree with the suggestion that the Company file some rate other than a three-part rate.

I have written you at length regarding this Lebanon rate situation because I know that to deviate from the three-part rate would be retrogression that would operate to the detriment of all concerned and also because the Lebanon situation had reached a point with the experience under the three-part rate, and the bettered business conditions which will permit us to give Lebanon a hitherto unknown gas service if we are allowed to continue under an equitable rate.

I again call attention to the fact that in this lengthy letter I have in no way discussed the amount of the rate. I should be glad to have my representatives go into this subject fully with either the City, the Commission, or both, and I can promise in advance that changes in the amounts which may on examination appear most advantageous to all concerned will be promptly accepted.

We are confident that if you will give this matter sufficient time and attention we can demonstrate that the statements here made are true—that we cannot properly serve the public or save our investment except by the adoption of the three-part rate—and we earnestly solicit a full hearing on this matter.

Respectfully yours,
LEBANON GAS AND FUEL COMPANY.

When you have two men from which to select for promotion give preference to the man who gets the greatest efficiency out of his scheme of living and can make his own income go the farthest.

—HENRY L. DOHERTY.

The National Association of Railway and Utilities Commissioners is composed of members of the state commissions regulating public utilities. Each year these commissioners meet and discuss problems with which some of them have been confronted and which may come up elsewhere. At their 1922 meeting in Detroit Mr. Doherty was asked to make an address, which follows:



THE regulation of public utilities by vesting the power in a state commission has proven a great step in advance over regulation by either the legislature or the city governments. What has already been accomplished is an evidence that still more can be accomplished. The public has been greatly benefited by results secured thus far, and I believe will secure immensely greater benefits when we cease to regard these commissions as merely rate regulating bodies and look to them to do all that can be done, and especially in an affirmative and constructive way to secure the most adequate service of the highest type and with greatest economy to the public.

When the public learns to look to its state commission as to what should be done rather than expect to tell the commission what it shall do, then and only then will all of the benefits be realized that are possible through intelligent regulation.

The violent opposition of many of the public service companies, which was at one time in evidence, against being placed under state commissions has now so largely subsided as to have almost disappeared. The movement had not progressed very far until they realized they were fighting against the inevitable. Of course, many of these old reactionaries would prefer to go back to the old conditions, but they know it is useless to openly advocate this under present conditions. These reactionaries have fared worse under state commissions than under the old conditions. They can, under state commissions, no longer control their situations by political manipulation.

Under the old condition of city council or legislative control, even if the situation got away from them, it did not require a man of much brains to secure, for example, the adoption of a rate so low as to be plainly confiscatory and one which the courts were bound to enjoin. The reason the public seldom actually got a lower rate under the old system was because the newspapers and politicians who "hollered" the loudest for a reduction in

rates were the last ones that were really seeking a reduction in rates. They did not want the public to get a satisfactory rate if that meant they would lose an "issue," for they wanted the "issue," not the reduction.

Agitation by newspapers and politicians for reductions in rates were a daily diet, but an infrequent accomplishment. A bill or ordinance would be passed which was generally intended by the agitators to be so drastic that it could not be accepted. An injunction would issue, and then, after a long and expensive legal battle, the court would be compelled to declare the rate confiscatory and the issue would then be still alive as a basis of another political campaign.

Agitations of this character have been carried on in almost every city and have generally been an "issue" with no accomplishment whatever, sometimes for years. Any one of these issues could have been disposed of by a state commission with a trained staff, if not immediately, then at most in a matter of a few weeks.

The constructive and progressive public service companies want intelligent regulation and don't want to be compelled to fool with politics, and believe this can only be accomplished by state commissions. Intelligence without courage will accomplish but little. We are entitled to justice and this we do not always get. This is generally due to a lack of public understanding and perhaps we public service men are as much or more to blame for this situation than you men are. A large part of our citizens still think it is the duty of the state commissions to give the public service companies hell instead of justice. Too many of our citizens want service at the lowest cost regardless of whether it is adequate for the company's needs or not, and yet inadequate rates mean in the long run higher rates.

It would be just as poor economy to give your draft horse and your milk cows just enough food to keep them alive. The sooner the public learns to regard your state commissions as professional bodies and follow your guidance as such, the sooner will the public get the benefit of all that you can do for them. You can hardly imagine a man going to his physician, and after the physician had made a careful diagnosis and had written out his prescription, to then have the patient look at it and tear it up and order a new prescription with whiskey substituted for aro-

matic spirits of ammonia. In other words, the public must learn to take what you know is best for them rather than to insist that you give them what they think they want.

In the early days our public service companies were regarded merely as private corporations competing with every other means to supply some particular public want, including other companies working under competitive franchises. Competition in this, as in other businesses, was depended upon to fix the price. Competitive franchises were not only often granted, but were frequently offered. It soon became plain, and was universally accepted, that the public would best be served by a single company, and that unnecessary duplication of investment meant higher priced, not lower priced, service.

It has only been a few years since public utilities were indiscriminately subjected to competition. After many decades the public concluded that it was a sufferer by this competition, and then solemnly resolved that best service at lowest rates could only be had for the public by doing away with competition, and the public said: "We are going to recognize you as a necessary and natural monopoly, but if we do this we must regulate your service and earnings." We accepted this partly because it was right, but largely because there was nothing else we could do. The fashion swept across the country of passing regulatory bills and creating public service commissions—and yet this work was hardly under way before the street railways of the country were subjected to the rottenest and most unfair form of competition. I refer to jitney competition.

The expenses to a public utility company in being ready to give service are always present, although in some lines of business, like the street railway business, it may be hard to charge on a readiness-to-serve basis. Giving service here consists in having a car come down the street every five, eight, ten or twelve minutes, whether anybody is there to ride or not, and the man in the outlying district who wants to take the train at, say, 10:30 at night knows that he can go out at a certain time and catch a street car and get to the station.

If we were to simply run our cars as required to give service, carrying no passengers whatever, our expenses would probably be 80 per cent of what they are carrying passengers; so, in a way, 80 per cent of all the expenses of a street railway are readiness-

to-serve expenses, and 20 per cent is represented by the carrying of passengers.

Along comes the jitney, and the public forgets all about the fact that we have had profits above a nominal rate taken from us for a period of years on the theory that, being a monopoly, we were not entitled to anything more than a meager rate of return, and so we are again thrown into competition, and yet our competitor bears none of the expense of being ready to serve the public. Our competitor simply carries passengers when it pays to do so and takes enough of the cream off of our business to perhaps make the whole undertaking unprofitable.

It is idle to suppose that a rubber tired vehicle using gasoline—which is the most expensive fuel on the market—for motive power, and with an engine working on about a 5 per cent load factor, can possibly give as economical service to the public as a street car with steel wheels on steel rails supplied with electric power from a central power plant. If you were to close down your street car system and depend solely upon jitneys for service and force them to really give service equal to street car service you would soon find your cost of service would be double as much and more than from a street railway system free from jitney competition. This jitney competition is simply a repetition of the old folly of competition with a natural monopoly, and, having learned the lesson once, does every new generation have to relearn it by bitter experience? Jitney competition is bound to prove harmful to the public in the end and should be prohibited by every regulatory body. It also represents one of our serious national wastes, and if it is not stopped by the proper regulatory bodies it should be made a national issue.

I will now proceed to point out some of the important matters that I think you gentlemen should consider. They may not be new to you, but none of them seem to be ready for universal acceptance and are, therefore, worth discussion.

PROFIT SHARING

If the public utility business is to command the same efficiency and interest on the part of capital and management as will be secured by other and more profitable lines of business, it will be necessary to adopt some form of profit sharing between the customer and the company to stimulate extraordinary effort. This is done, in a measure, under the plan in vogue with the

South Metropolitan Gas Company of London, and is known as the London sliding scale. It was initiated by Sir George Lavesey and this general scheme has been adopted elsewhere. In my opinion, it would be much easier to secure the adoption of profit sharing and it would be more appreciated by the customers if profits were declared out to customers in the form of dividends the same as is done to the stockholders, rather than in the nature of lower rates from time to time.

The laws relating to public service commissions should be so broadened that the commission would have the power to fix an initial rate for a long period in advance, and then permit the company to earn all it can over what would now be considered a reasonable rate of return, with the provision that these earnings shall be divided between the company and its patrons. Under this plan the management can be premiumized out of the company's portion.

If the theory of control by the state commissions is a correct one, then is it not inconsistent to have a division of authority between the state commission and the city government or the legislature? In some states part of the cities are under the public service commission; others are not. Sometimes the gas companies are controlled by the public service commissions, but not the street railways. In my opinion, the best results would be secured by giving commissions the widest possible control.

There can be no real and substantial progress except by intelligent regulation. There can be no intelligent regulation except where regulation is exercised by a body that has available a trained staff. As an economic matter it would be out of the question for each city to maintain a trained staff. Even if every city attempted to do this the staff would for lack of experience never acquire the efficiency that would be acquired by the staff of a state commission. This is an activity which is obviously best carried out by cooperation.

If it is necessary to reserve any control to the citizens of the city or in the municipal government then this control should not be of a character to prevent the utility from functioning. I know the cry of home rule is potent, but it should not prevail with thinking people in this instance. One might paraphrase and say "Home Rule, what economic crimes have been committed in your name?"

station where we might alight we would drive to the nearest station, take the long part of our ride by the subway and then take another taxicab to our destination from the nearest subway station. This would do much to relieve the congestion on the city streets. The average length of taxicab travel per ride would be less. A taxicab service that would really give service could largely displace the private cars. Old and dilapidated taxicabs which are generally seen in most of our cities would either disappear from service or would only be used at peak load hours.

In our highly congested cities like New York I think we should give some thought to whether the delivery of goods and wares should not be treated as a public utility and make a regulated monopoly of this also. This would unquestionably greatly diminish the cost of distribution to the public and would materially lessen the congestion on our city streets.

Our street railways could be used to do a large part of this work, especially for what now requires heavy trucking, and frequently the track and equipment could be advantageously used during the night when otherwise there is no service or a small demand for service.

The science of cost accounting and methods of charging for the entire business world could, until a few years ago, have been represented by not much more than a huge cipher. It has not progressed greatly from this position. Some of the cost accounting and rate making which today is looked upon as scientifically correct is not even based on facts which are fundamental, and in many instances controlling. Even in railroad rates, peak load business takes the same rate as 100 per cent load factor business, or what is still more valuable business to railroads; viz., business that can largely be handled at their convenience. There is nothing as yet in railroad rate making that tends to secure for the railroad a good load factor. However, I am not here as a railroad man and have enough problems of my own to solve without shouldering theirs.

No matter how backward this science as a whole may be, nevertheless for nearly twenty years this problem has received the most exhaustive study by the best minds in the gas and electric business.

As far as methods of charging are concerned, there is no hint or suggestion of any better method being found for gas and

electricity than the readiness-to-serve method of charging. Borrowing the thought of a popular advertisement, "You have got to come to it sometime, so why not now?"

Many gas companies face a gloomy future and nothing will save them except the adoption, to a large degree, of the principles of the readiness-to-serve method of charging. If the principles have proved themselves correct, and we find we must adopt them in part, why not adopt them as a whole and quit feeling around and experimenting and using them only to the extent necessary to keep the patient alive?

The system of charging for gas purely on the basis of consumption is too hampering and too inequitable to waste time in discussion. No man who is both thoughtful and sincere can even attempt to justify it. Its only justification is long years of usage. For many centuries we thought the world was flat, but that is no excuse for us to continue to do so in face of abundant proof to the contrary. We also have abundant proof to the contrary regarding rates based solely on consumption. We found that under the stress of war conditions rates based only on consumption had to be advanced to the point of diminishing returns and service charges had to be used in many cases not simply as a matter of justice, but as a matter of necessity. What we know will happen when rates are based solely on consumption by restricting sales should alone warrant the belief that a tremendous expansion of sales will result from the adoption of the readiness-to-serve method. If a customer is paying you \$30 a year for gas on the old system, and under the new he would pay \$15 as a readiness-to-serve charge, and then get his gas at half the present rate, it does not take much imagination to realize the stimulation this will give.

If you will not give me a high enough rate to earn a fair return on my property the courts will set your rates aside on the grounds of confiscation. Now if you insist on a method of charging which requires rates to be placed so high as to reach the point of diminishing returns, and, therefore, no rate based on that system will give an adequate return, why should the court make any different decision? Also how can you justify a system that either confiscates the investor's property or compels, say, half of your customers not only to pay all their own fair costs, but also to pay enough to make good the actual losses on your

other consumers, and then enough in addition to this to give a fair return on all of the company's property, whether used by them or by the other 50 per cent of consumers who are unprofitable? The force of tradition is so strong in this instance that we are loath to guide our actions by the knowledge of today, but cling to a system which was born of the ignorance of a century ago when the gas business started.

So long as gas companies work with such a handicap it is impossible to make rates which will compete with other fuels. Why anybody should be opposed to every consumer paying all the costs he occasions the company I cannot see, and in fact, I cannot understand with such a condition disclosed how any fair-minded man can fail to be shocked by the unfairness of the situation.

I am told that our Treasury Department at Washington does not feel that it can collect an income tax unless this tax amounts to at least \$50 per year. Our Treasury Department has no property devoted to the taxpayers' use and no capital charges to pay. The taxpayer makes out his own bill. The Treasury Department has no capital investment; has no service or meter to maintain, makes out, at the most, four collections a year, and yet a gas company is expected to furnish a large amount of physical property, stand ready to furnish service, read a meter, make out and collect a bill twelve times a year, and yet under some conditions the entire amount collected for the year does not exceed \$6. We will promise that our readiness-to-serve charge will not be offensive or objectionable to any consumer whatever who has any reasonable comprehension of what is fair.

Now I have painted the evils of inadequate and unfair charging and will, at another point, attempt to show what can be done by adequate and fair charges. As for the electrical business, the same is largely true. Sooner or later, in my opinion, we must come to the universal application of the readiness-to-serve method of charging, together with the use of limiting devices. Demands fixed on any other basis will work out with insufficient equity, and both the public and the companies will be injured thereby.

As for the street railway business, the solution is not so easy. Here we again have huge expenses which are due entirely to the necessity of standing ready to give service, with no simple

way whereby these readiness-to-serve expenses can be apportioned among the beneficiaries. The street railway business is today where some of the electrical companies were in the pioneer days when they charged a flat sum per month regardless of how much current was used, thus premiumizing waste. A ride is a ride whether for a block or for ten miles. Some system of metering must be used. A railroad company cannot carry a passenger for ten miles as cheaply as he can for one block. As our cities grow the average ride becomes longer and longer and will necessarily force up the average rate of fare. The street railroad men should have long ago found some way of metering the transportation portion of their charge, but reforms both in the gas business and in the street railway business have largely had to be forced from without rather than from within.

Equitable charging in the gas business was ridiculed for years. The same thing was true of the street railway business and is still more or less true, and until necessity forced consideration of the matter, no attempt was made to even take steps toward a more equitable system of charging. Riding should be based on distance with a fixed loading and unloading charge. That is, a small charge to represent the cost of stopping the car and taking on passengers and stopping the car and letting the passengers off, plus a fixed charge per unit of distance riding. I have always been told that such a system would be impracticable, but I see no reason to think that it could not be worked out in a very satisfactory way, except for the lack of interest on the part of street railway men. The system of uniform charges for street railway rides, to my mind, not only has brought harm to street railway companies, but harm to the public as well.

The meagre transportation facilities in many of the European cities which, however, seem adequate, can be explained only by the fact that anything in the nature of a distance system of charging tends enormously to increase the capacity of the transportation system by premiumizing short rides and discouraging long rides, and this in spite of the fact that many of the European zone systems are hopelessly faulty.

Our present system of charging encourages conditions which bring about higher cost to the company and to the public. A proper system of distance charging would tend to keep the workman who is employed in a suburb, living in that same suburb

instead of having him perhaps crossing the entire city to reach a settlement of his own type of people. It would also cause people to do some of their shopping in their immediate neighborhood and would give us the very desirable thing in city life of having less congestion and yet able to function with less transportation facilities.

The policy of using a uniform fare does not encourage less congestion, as is largely supposed, but the exact opposite. Many of our street railway systems have reached the point where they cannot under the present inequitable method of charging continue to exist. The car riders are not the only beneficiaries of street railway service and, therefore, perhaps, the car riders should not bear all of the readiness-to-serve expenses. The passenger transportation facilities and operation are a necessary part of our city life. It could even be argued that it is a common expense so far as the readiness-to-serve expenses are concerned, and one which all property owners should bear, and I have suggested for a long time that it would not be inconsistent for the public to pay a part or perhaps all of the readiness-to-serve expenses of a street railway company, raising such a fund by a property tax. I am not posing as an expert on railway economics, but am merely throwing out these views as a suggestion. Take the example of a man who lives in the outskirts of the city and uses, for his own transportation, automobiles exclusively. Nevertheless, much of what is necessary to maintain his home depends upon street railway service, not simply for the errand boy, but for the transportation of mechanics called to his premises and for the transportation of his own servants and matters of that sort.

In fact, the thought has heretofore been that public utilities should be expected to bear some sort of a tax or other burdens in exchange for the right to use the streets of the cities. In my opinion, this theory is all wrong and we must sooner or later completely reverse this theory. In the old days it was presumed that these taxes or burdens were paid for by the stockholders, but with a regulated monopoly it must be remembered that these taxes are paid by the patrons.

A street car with one hundred passengers in it blocks traffic much less than fifty taxicabs or private cars with an average of two people each. A street car carrying twenty tons of freight

blocks the street much less than forty delivery wagons carrying even five hundred pounds of weight.

As for our gas and electric companies, they transmit over or under our streets the equivalent of an enormous amount of fuel without interference with the traffic, without noise and without wear and tear on the streets. Imagine the confusion that would be added to the very bad congestion that now exists in many of our cities if we were to attempt to displace all of the energy transmitted by our gas and electric companies back to wagons and trucks, and imagine what a relief we would have to the congestion in our cities if all fuel for heating purposes could be transmitted through underground pipes, and all fuel for lighting purposes transmitted in the form of electricity over or under our streets.

As a business proposition I think you could afford to premiumize all forms of public utilities by paying a portion of the readiness-to-serve expenses by a property tax. This could be apportioned on the basis of land areas on the theory that it is distance that largely fixes the investment; or it could be on valuation, on the theory that valuation will roughly represent the congestion; or it could be, perhaps, on a combination of the two and secure greater equity than by a tax based solely on land area or valuation. This would not mean an additional tax against property to the full amount that was paid because a substantial saving, which is now a property tax, would result in less wear and tear on the streets, less traffic congestion and less salary for traffic officers.

FINANCIAL MATTERS

The bond houses have for years talked to their clients that they must demand a bond earning double its interest rate, or a provision of that character, and a substantial sinking fund. Anything you gentlemen can do to educate the bond buyer, and primarily the bond houses, that no large ratio of earnings are needed in relation to bond interest, will be a great help to the development of our public utilities and that an exclusively cash sinking fund should be eliminated—if any sinking fund whatever is demanded it should be one which could be satisfied either by cash or by the creation of more property without issuing bonds on it, at the option of the company. We now have the absurdity of issuing bonds for additional property, and find-

ing new buyers for them, while we are at the same time, through the operation of the sinking fund, taking up bonds from satisfied holders. The object of the sinking fund is purely to insure a proper relation between outstanding bonds and the value of the property, and this can as well be maintained by the addition of property as by the reduction of debt.

GAS STANDARDS

Two or three years ago the Bureau of Standards put out a new circular on gas standards and sent me an advance copy for my comment. I wrote back to them saying this, in effect: "I have your new circular on gas standards, but have little more interest in it than I would have in instructions as to how a cable railroad should be operated. Now, the only difference between a cable railroad and our present gas standards is that one is already obsolete and the other ought to be."

The gas standards now in vogue are a joke, even if there isn't anything funny about them. They are a relic of the day when gas was not only used for a different purpose, but with different apparatus.

Tradition is hard to get away from. When we started to design automobiles every designer wanted to make them like a buggy and every designer put a dash board on them and some of them even had a whip socket on the dash board.

We not only do not need the type of gas that we now supply, but other gas less expensive, both as to investment and operating expenses, would give better results. Our present gas is almost entirely used for fuel purposes, and when properly used, in almost every instance, has to be diluted before it can be successfully used. Our standards are still almost entirely influenced by the fact that gas was originally used exclusively for illuminating purposes and entirely in open burners.

Today in some cities not more than 20 per cent of the gas is used for illuminating purposes and 95 per cent of the gas so used is used in mantle lamps, leaving only 1 per cent of the total gas that must be enriched to comply with the need for which it is used. Imagine the absurdity of carrying on an expensive enrichment process which is only needed for 1 per cent of the total amount of gas used, when this enrichment—if it is really needed at all—could be secured on the consumers' premises by carbureting the gas with gasoline vapor. But the absurdity

becomes still greater when we stop to think that the gas used in open tips for illuminating purposes is due entirely to shiftlessness, for by the use of mantle lamps the illumination could be increased many times and the customer would be actually benefited by being supplied with a non-luminous gas and thus forced to use mantle lamps.

RAW MATERIALS

At the time the standards under which we now work were created there was an abundance of high grade coal to be had at prices practically the same as the prices prevailing for what we then regarded as inferior grade coals. Many gas companies throughout the country cannot meet the standards created many decades ago except by buying high grade coal, commanding a premium price at the mines and frequently requiring shipments for long distance and at great expense.

In the early days of the oil business many of the products were almost unsalable, and any of these unsalable products could be used for the enrichment of gas. Frequently gas companies bought oil products for the enrichment of gas at far less than the cost of crude oil. Today there are no waste products in the oil business, and what has been known as "gas oil" for years is now the product from which the refiners produce synthetic gasoline. With the growing scarcity of oil we must expect a higher price for all petroleum products, and in addition to this, on account of new uses for gas oil, we must expect a specific additional increase in the price of gas oil.

NEW STANDARDS

If we continue to work under our present obsolete and unnecessary standards it is not so much a question of how we are going to have a cheaper supply of gas, but the real question is how we are going to prevent a continual increase in the price of gas.

The customer is no longer interested in the matter of candle-power. The same thing that gives luminosity to the open flame is the thing which blackens the kettles and brings many of the troubles which lower the efficiency of the gas in practical use.

The consumer is not interested in what the B. t. u. are per cubic foot. Marsh gas, which is the principal constituent of natural gas, has about 1,000 B. t. u. per cubic foot, and yet is practically non-luminous when burned in an ordinary open tip

and will not yield as high a flame temperature or more efficient service per B. t. u. as, for instance, an unenriched water gas which has only 300 B. t. u. per cubic foot.

Rational standards are simple. You want a gas which is safe and pure and one which will do the work. Natural gas containing 40 per cent inert matter is now in satisfactory use. Until we can set up a positive standard as to flame temperature we can provide that the gas must have a flame temperature equal to a mixture of 75 per cent marsh gas and 25 per cent nitrogen. As for purity the public are interested only in sulphur and we can accept your present standards. Then instead of charging the consumer for cubic feet charge them for B. t. u., as is now practiced in England, but don't adopt the "therm." It is 100,000 B. t. u. and is too large a unit. To avoid the confusion that now exists in the electrical business between a watt and a watt hour, or a kilowatt and a kilowatt hour, use one name for a specific amount of energy and a different name to express the rate of supply of energy.

GAS MANUFACTURING PLANTS

The manufacture of carbureted water gas required a heavy investment as against plants making unenriched water gas. The water gas machines must generally have coke or hard coal for fuel, and it is customary for a water gas plant to be equipped with a coking plant sufficient to supply the needs of the water gas machines for coke.

Public regulations regarding the storage of oil in or near cities are such that large stocks of oil cannot be carried, and storage tanks must be of a character and size costing several times as much as the type of tank used for the storage of oil in the fields.

Coal gas plants require a still heavier investment per thousand cubic feet of gas made, and the gas making apparatus must be maintained at a uniform temperature throughout the life of the equipment and must for economical success make gas at a uniform rate. A single shutdown of a retort plant or byproduct coke oven creates a damage to it equivalent to one year of hard usage.

In making coal gas only about 20 per cent of the energy value of the coal is converted into gas, and, therefore, five tons of coal must be handled to produce the same energy in the form

of gas as would be produced by a single ton if the coal were completely gasified. We have seen from the above that the important thing to secure cheap gas, and in fact to prevent other increases in gas, is to do away with our present standards and adopt rational standards.

BYPRODUCT GAS

It is also important to avail ourselves of the present enormous supplies of byproduct gas, namely, gas which is made unavoidably in manufacturing other products. This is important not simply as a means of a cheap supply of gas, but to enable many gas companies throughout the country, which are now so near the point of bankruptcy that they are unable to finance new generating equipment, to enlarge their plants to meet the demands that are being made upon them.

Byproduct coke ovens for the manufacture of metallurgical coke are not new but have been used for many decades in Europe. However, their use in this country has only come about on an extensive scale during the last two decades. Prior to that time all coke was made in so-called beehive ovens, where the gas was entirely wasted. The rapid development of the byproduct coke oven in America has been brought about, not primarily due to economy, although this is vastly important, but was forced by a scarcity of coal suitable for use in the beehive coke ovens.

Many of the byproduct plants have been located where the gas must go partially or entirely to waste, and others of them have been installed at points where the gas can only be used for its fuel value and for purposes for which a cheap coal would be just as satisfactory. In some cases these byproduct coke ovens have been installed where the gas can be piped into the mains of the gas company supplying the city, but this is not the usual thing.

The great obstacle that prevents the use of this byproduct gas for city purposes is the various restrictions on the ability of the gas company to make a binding contract. All contracts are subject to the approval of the public utility commission, and it is not certain that a contract approved by the public utility commission can be for a longer period than the life of that commission. This has proved a great obstacle in trying to induce the steel companies or the coke ovens making coke for metallurgical purposes to either locate their coke ovens in or near the city

where the gas can be used or to build the necessary pipe lines to carry gas to the cities. They are unwilling to make these investments unless they can contract for gas for a period of years sufficient to enable them to earn, we will say, a sufficient return on a long pipe line and to amortize the investment over the period of the contract.

There is also the added obstacle that only the richer portion of the gas made by byproduct coke ovens can meet the present standards for gas, and, therefore, half or more of the gas produced in byproduct coke ovens must be thrown away or devoted to some inferior use, although just as satisfactory in every way for the supply of city customers. It is customary now to use what is known as the leaner portions of the gas to fire these ovens, but the ovens could be just as well fired, and in some cases are fired, by the use of cheap producer gas having, we will say, 125 B. t. u. per cubic foot.

It should be our effort to have these coke ovens either located in or near cities that can use the gas or to pipe the gas from these coke ovens to the cities and to utilize all the gas that is made and not simply the richer portion of it.

If the steel business was running normally it would probably require half again as much coke as can be made in all of our byproduct coke ovens and, in the interest of conservation, all of this metallurgical coke should be made in byproduct coke ovens, permitting the saving of the gas, tar and ammonia.

BYPRODUCT GAS FROM OTHER PLANTS

Coal is the great source of raw material for the chemical industry. More products can be produced from coal than perhaps could be printed on a full page of a newspaper. However, to secure these different products necessitates the distillation of coal in many dissimilar ways, and yet our present gas standards virtually compel all coal used for gas making purposes to work under constant conditions and fixed temperatures, producing only such products as can be produced under these conditions.

During the war Germany was cut off from an adequate supply of oil and was compelled to resort to the known processes and what new processes she could develop to secure not only all classes of oil from coal, but many of the other chemical products needed. This has laid the foundation for an enormous chemical business, of which coal will be the raw product and a

certain amount of gas the byproduct. England and France also found it necessary to strip from the gas used for town distribution all of the condensable products, including benzol, toluol and light naphthas. While these are the principal agents which give luminosity and high B. t. u. density to the gas it was found that the service to the consumer was not only unimpaired but some believed greatly improved.

While it has been pointed out repeatedly in England that our present standards were highly absurd, producing an economic waste which benefited no one, nevertheless nothing but war necessity was able to force England to the realization of this, but once having realized this it resulted in legislation permitting the board of trade to abrogate all candlepower and B. t. u. standards and permit each gas company, with the consent of the board of trade, to manufacture that type of gas which is satisfactory to the customer and yet the one that the gas company can manufacture to the greatest advantage.

This has given an enormous stimulation to the development of new gas manufacturing processes, and we may reasonably expect to see more development in the next few years than has been made in the last half century, for therefore there has been no incentive in this line for the man possessed of inventive genius. It is unfortunate, however, that the one country recognized as having the greatest inventive genius is still handicapped by these obsolete standards. Nevertheless, a great deal of work is already in progress toward the creation of chemical plants using coal as their raw product and all having gas as one of their byproducts.

BYPRODUCT GAS FROM WOOD DISTILLATION

One of these processes, which I understand is already at work on a commercial scale, is aimed to supply an artificial fuel which will take the place of anthracite coal and which is made from bituminous coal. The large portion of the volatile matter of the bituminous coal is driven off as oil or gas and the plastic mass of coal remaining in the retort is pressed into a briquet of great density, approaching that of anthracite coal. The plant which uses this process, I understand, is throwing its gas into the air without use. Possibly the ability to sell the gas from these chemical plants will be a great factor in making them a commercial success and will go a long way toward putting America

on a parity with the foreign countries in producing raw chemical material from coal.

Large quantities of wood are carbonized in this country to produce charcoal and raw chemical compounds. The gas, however, does not conform to our present absurd standards, although it would make a very satisfactory gas for the use of the customer. It is not uncommon to see places where huge quantities of waste wood are being burned in incinerators—and perhaps within a stone's throw gas is being made for town distribution of high grade gas coal or oil which has been shipped from long distances away.

There are few classes of business that can submit to public regulation and live. Changed conditions must permit an immediate change of plans. This is not possible when a change in plans can only be made after hearings before a public regulatory body. Perhaps the greatest damage that has been done by public regulation has been the element of delay and the abandonment of any attempt at certain improvements in the belief that simply time and trouble would be wasted and no good would be accomplished. Therefore, it will never be possible for the so-called public utility companies to embark upon any business not absolutely necessary for furnishing the product they are selling to the public. In other words, they could not go into these chemical ventures or things of that sort.

Businesses of this class have huge profits one year and possibly huge losses the next, and they must be undertaken by private corporations, for the whole theory of public regulation has one inherent weakness which few people appreciate—namely, that all profits in excess of a certain amount must be reduced by the fixing of lower prices to the public, and yet the public in no way guarantees these companies against a loss if conditions are such as to cause a loss. It is a case of heads I win, tails you lose. If the regulated company is able to earn big profits, such profits are immediately taken away from it by the establishment of permanently lowered rates inviting losses at a subsequent time, and if conditions swing about toward higher costs for the public utility company it must bear these losses alone.

A number of gas companies have already abandoned service, others are in various stages of the abandonment of service. The gas plant at Niagara Falls, I think, served notice that it would

abandon service on February 1, 1921, but the public utility commission has ordered that service should be maintained and apparently found some way to force or induce the company to do so. Many of the gas companies throughout the country have already been so badly crippled that they could not now raise the necessary money to put in needed additional generating equipment, nor could they put in improved generating equipment if the standards were changed as to permit them to do it—and that is another reason why these companies must have the freedom to contract with byproduct coke ovens and chemical plants, and this contract must be one of unquestioned integrity which will warrant the investment of a large sum of money.

The bill passed by the New York Legislature permitting gas companies to contract for gas created by plants built primarily to supply other commodities is only one of a number of reforms that must be accomplished, and probably all of them will require more or less legislation.

INDUSTRIAL GAS

So long as gas companies are compelled to make enriched gas they are at a hopeless disadvantage in building up an industrial load such as has been built up by the electric companies. Their gas is not only unsuitable for the many industrial operations, but they also have an economic disadvantage of being compelled to make their gas out of expensive raw products, while the manufacturer can make his gas out of any cheap fuel available. A large amount of hydrocarbons in an industrial gas is highly objectionable, for it cannot be used in regenerator furnaces without the hydrocarbons breaking down and depositing their carbon. How far would the electric companies have got in building up their present enormous industrial load if they had been forced to burn wood or gasoline under their boilers, and yet that is the nature of the handicaps under which gas companies work, for our present absurd standards force us to use expensive raw products, and, of course, it would be impossible for the domestic consumer to be supplied at the present low rate, except for the large portion of the companies' expenses which are paid by their industrial customers. Take the shackles off the gas companies and as we build up a large industrial business we will be able to serve the domestic customers at a much lower rate.

The same gas which makes a good gas for industrial purposes makes a very satisfactory gas for domestic purposes, so far as the customers' needs are concerned. The domestic gas consumer is not interested at all in the B. t. u. density of his gas, but the gas company is vitally interested in this. There would be some justification in fixing a voltage at which electric companies would have to serve their customers, but we all know that so long as the voltage is safe, the customer is dealing in watts and the gas company is dealing in B. t. u.

Suitable solid fuel for domestic requirements is becoming so expensive and the cost of handling this fuel and the ashes it produces, together with the cost of attending a furnace, are all now so great that I am confident it is possible to substitute gas for solid fuel in the home, provided you men will give us: (1) The right to charge all consumers on the readiness-to-serve basis, (2) to use a demand limiting device which will limit the customer to the demand he pays for, (3) to supply whatever gas we can buy from others or can make for ourselves that will give satisfactory service to the consumer (the character of the gas would in many cases vary because we must avail ourselves of the cheapest material at each particular point of manufacture), (4) the right to make long-term contracts with byproduct coke ovens and chemical plants.

The man who preaches discontent is the maker of a traitor to our country.

—HENRY L. DOHERTY.

R. G. Griswold wrote a paper for the 1922 convention of the American Gas Association, entitled "Further Presentation of the Doherty Ideal Distribution System." Mr. Doherty's discussion of the paper was as follows:



WHEN I learned that a paper had been invited on the Doherty Ideal Distributing System I planned to either assist in the writing of this paper or to contribute a discussion to it.

If you were active in the gas business twenty years ago you must have heard my plans and ideas on gas distribution severely ridiculed and I, therefore, wanted the subject, if it was to be discussed at all to be treated

in a manner so you could judge for yourself the practicability and usefulness of my work.

I expected to be able to show what could be done by the adoption of these principles by actual example. I intended to lay out an ideal city and then show how the ideal distributing system would be applied to it and also to take one or more actual cities and show what the present distribution is and what the ideal system would be. I will undertake to secure such a paper for your next convention if it is wanted.

The death of my partner Mr. Frueauff on July 31st, has caused me to again assume the duties as active executive of our business and the various corporations we control, and it has, therefore, been impossible for me to make such a contribution as I then had in mind.

I have only had time to hastily read Mr. Griswold's paper and not proper time for its study. However, I want to say something on the subject and enough I hope to convince others of the importance of our distribution problems and to impress on them the fact that vast improvement is possible. In reading Mr. Griswold's paper and my discussion of it, the figures given are so different that you will be hopelessly confused unless you bear in mind that his paper treats primarily of the ideal distributing system without service pressure governors, while most of my figures are based on what can be done with pressure governors on every consumer's premises.

At the time I was doing this work it was impossible to secure a tolerant hearing from the gas fraternity of anything in the nature of a departure from the then existing practices and tendencies.

The tendency at that period was toward the use of larger and larger distribution mains and one New England gas man who was very prominent at our conventions in those days repeatedly stated as an argument for larger distributing mains that we ought to use 4-inch cast iron pipes for services.

The intolerance of that period has now largely subsided and possibly an intimate discussion of the subject more or less in the form of a story may encourage many of the highly educated and well trained young men now in the business to take up and finish the work I attempted to do and to correct and improve what I have done.

In the middle of the 90's I was called upon to take charge of an alternating current electric station. In those days it was not usual to have integrating meters on the switchboard and only indicating instruments were used. Even these as a rule were of doubtful accuracy. It was also customary to have many customers who paid a fixed sum per month and as a rule these customers had no meters on their premises.

At first I could not determine what our losses were, but estimates indicated losses of nearly 75 per cent. When it was possible to make accurate measurements I found that the "line, meter and transformer efficiency" was less than 30 per cent—that is to say, there was less than 30 per cent of the current sold that was generated.

I found that few of the alternating current stations throughout the country had an efficiency much higher than this. I soon located the cause of these losses, planned out a different form of distributing system and brought the "line, meter and transformer efficiency" on many of our circuits up to 80 per cent, and except for the excessive loss on the commutator type meters, could have had all my circuits working at an efficiency of 80 per cent or better.

The distributing system that I adopted at that time has been standard with us ever since. I used transformers with interconnected secondaries and adopted the size of a secondary conductor that would yield the greatest economy and yet maintain satisfactory regulation. The calculated size of the most economical conductor was so small that the commercial wire then on the market would be of insufficient strength for sleet storms and matters of that sort, so the secondary conductor that was used was determined upon as a matter of mechanical strength. These systems were so laid out that added load could be taken on without exceeding the variation of voltage necessary for satisfactory regulation. In fact some of these systems installed more than twenty years ago have never been changed in the slightest, and the regulation is better today than it was then in spite of the enormous increase in load. This is due to the fact that additional load required more transformer capacity, and each added transformer lessened the feeding distance.

I then turned my attention to the matter of securing a better induction meter or a better commutator type meter with a

smaller shunt loss. Both of these points were accomplished and to what extent I was a factor I am unable to say, but I can say that my criticisms of electric meters and my plea for better meter and my suggestions as to how to make them better meters were cordially welcomed by the electric manufacturing companies.

Several years thereafter, in fact about 1901 or 1902, I turned my attention to gas meters and found there was a deplorable situation. All of them were faulty in design and some of the ten-light meters of some manufacturers were smaller than the five-light meters of other manufacturers. The conditions I found were not complimentary either to the gas meter manufacturers or to the purchasers of the meters. In those days we had a large number of manufacturers of meters more or less independent rather than the almost unified control which now exists. One of these manufacturers immediately gave me his cooperation but the work I did in the investigation of gas meters caused me to lose many friends both among the meter manufacturers and the meter purchasers.

I refer to this for two reasons—1st: There are a few now who are inclined to criticize me on the grounds that I could have been of more service to the gas business than I have been, and I want them to know the difficulties I experienced in trying to be of service and why my energies were largely directed to other industries, and 2nd: Primarily to excite work towards further improvements in meters because in event we succeed in substituting gas for solid fuel in the home and also lower the calorific value of our gas, the meter problem will be one of our difficult problems.

After my work on electric distribution I turned my attention to the matter of gas distribution. This was in the late 90's. I believed that some of the things I had learned in electric distribution work could be made applicable to gas distribution problems. There are, however, radical fundamental differences between gas and electric distribution. All of the energy of the electricity is in the form of energy of pressure, while with gas the energy represented by pressure is very small.

For example, a 6-inch main can handle a maximum of 40,000 cubic feet per hour economically with a drop of pressure 16-inch per 1000 feet or 15 pounds in five miles. The B. t. u.

delivery, assuming 600 B. t. u. gas, will be 24,000,000 per hour maximum and average about 10,000,000. The power to pump the gas can be supplied with 650,000 B. t. u. per hour maximum and 130,000 B. t. u. per hour average. This average loss for transmission is only 1.3 per cent of the average delivery. Electric distribution losses due to resistance of conductors are seven times as great. An 8-inch pipe would handle the same load with an average loss of .43 of 1 per cent.

In the electric distribution you must for a given pressure increase your copper by 2 to increase your conductivity by 2; but with gas you get about 5.6 times the conductivity by doubling the size of your pipe and even if the weight of your pipe goes up as the square of the diameter you increase your conductivity in relation to the weight of metal as one is to 1.41. In the electrical business our conductors are of numerous sizes with regular graduations both as to size and cost, while in the gas business we must work with a limited number of conductors to choose from, and these conductors (pipe) have no regular graduations, either as to conductivity or cost, therefore, the planning of an ideal distributing system is largely a matter of cut and try. The following table will show the steps in cost and conductivity:

Size of Pipe	Relative Cost	Relative Conductivity (Nominal Diameters)	Relative Conductivity Per Unit of Cost
2	1.	1.	1.
3	1.62	2.75	1.70
4	2.69	5.65	2.10
6	3.65	15.6	4.27
8	5.13	32.	6.23
10	6.43	56.5	8.8
12	8.00	88.	11.
16	11.45	180.	15.7
20	16.00	320.	20.
24	21.00	495.	23.5
30	29.30	900.	30.6
36	39.00	1370.	35.
42	50.20	2050.	41.
48	65.30	2800.	43.

In the electrical business we refer frequently to Thompson's law. This law, as originally stated by Sir William Thompson, was as follows:

"The most economical area of conductor will be that for which the annual interest on capital outlay equals the annual cost of energy wasted."

However, I interpreted the law to mean—that that size conductor should be chosen which would give the lowest total cost. In other words—that it is possible to compute the most economical size conductor for any given load. I have used this so-called Thompson's law in an amplified form ever since, and with the ability to analyze your problems you can solve a great many of your engineering and business problems mathematically and take them beyond the realm of opinion.

My first effort was to compute what size of pipe should be used for different volumes of gas. These figures were in marked contrast with the then existing practice indicating that the average city could be supplied most economically with $\frac{3}{4}$ -inch distributing mains. I do not remember just why I adopted a 2-inch pipe as the minimum size main. It is unquestionably—as I will show you—much larger than need be. But what follows may give the reason.

I have always felt that it was possible to substitute gas for solid fuel almost universally and perhaps exclusively in the home and I have also felt for years that we might come to a much lower calorific value; in fact I have always felt that unless some new discovery could be made that we would eventually use blue water gas. I have always felt that if we were to substitute gas for solid fuel in the home it would be accomplished partially by more efficient appliances for its utilization and when we are selling gas for exclusive use in the home that our consumption would be equivalent to 120,000 feet of natural gas per customer, which would be about 200,000 cubic feet of artificial gas or about 400,000 feet of blue water gas; that the maximum hourly demand would—under the readiness-to-serve method of selling and with use of a limiting device—be possibly as much as 200 cubic feet in this type of gas if the demand portion of the charge was not too high. These changed conditions would then give us an average demand of 40,000 cubic feet to the mile, and except in rare instances the maximum above the average would not be more than double. These amounts when converted into Mr. Griswold's method of stating it would be an average of 8 cubic feet per lineal foot and a maximum of 16 cubic feet per lineal foot. I will now

attempt to show that even on this basis a distributing system properly laid out to secure a maximum economy would give you a system having approximately 60 per cent of the total mileage made up of 2-inch mains.

Most of our American cities are laid out on the checkerboard plan and generally in blocks twice as long as they are wide. Probably more cities, or additions to cities, have been laid out with eight blocks to the mile in one direction and sixteen blocks to the mile in the other direction than any other one dimension.

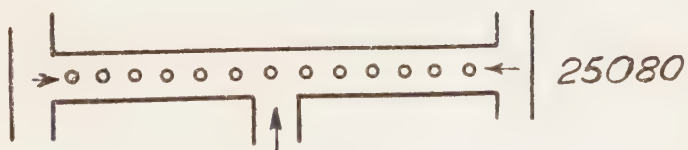
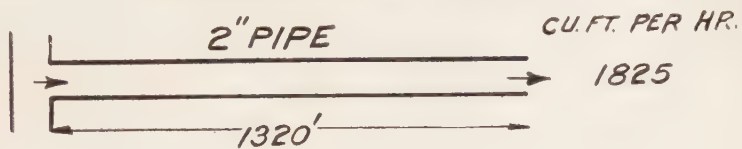
If all distributing pipes are fed at four points to the mile (a feeder on every second cross street) it gives you a maximum feeding distance of 660 feet and with maximum built up condition in all probability this load will be uniformly distributed.

By borrowing Mr. Griswold's form of diagram showing what the 2-inch pipe will do and applying it for (1) a run of two blocks, or 1320 feet, delivering all of the gas to the end, (2) a run of this same distance with the gas uniformly distributed and (3) the same fed at both ends, which would mean a feeder main every two blocks and (4) the same thing with feeders on each block. It shows that a 2-inch pipe will deliver 19 feet per lineal foot more economically than any larger size. If your distributing mains are laid the long way of the block and your feeder mains across the short way of the block, it is apparent that $33\frac{1}{3}$ per cent of your mains are feeder mains and that the remaining $66\frac{2}{3}$ per cent of your mains are either transmission or distributing mains. As you will have but one transmission main and the balance will all be distributing mains you will see that except for cross feeders your 2-inch distributing mains will represent $66\frac{2}{3}$ per cent of your entire system.

If we assume the average load factor that now exists using gas primarily for cooking it would be in the average city probably not far from 40 per cent. By load factor I mean that the average consumption would be 40 per cent of maximum consumption. As the power required to pump this gas varies as the square of the volume the per cent of what might be termed power load factor would be much less; in fact about 20 per cent.

Now if we assume that we are supplying not only gas for cooking and incidental water heating but also for all water heating and all house heating, the yearly load factor would be about 30 per cent, and the power load factor would be approxi-

PRESSURE DROP = 15.2 IN.



mately 13 per cent, according to Mr. Griswold's data, but according to figures I have given you above our load factor would be about 22 per cent and our power load factor about 10 per cent.

Taking now this schedule of cost for $\frac{3}{4}$ -inch, 1-inch, $1\frac{1}{4}$ -inch, $1\frac{1}{2}$ -inch and 2-inch pipes we find that the greatest economy will be secured by a $\frac{3}{4}$ -inch pipe under existing conditions until we reach 2.2 cubic feet per lineal foot of pipe, and the following table is I think explanatory:

Size—Inches	Maximum Demand Capacity Cubic Feet per Foot
$\frac{3}{4}$	2.2
1	3.0
$1\frac{1}{4}$	6.7
2	26
4	75
6	180

The average maximum demand per lineal foot is now and has been for many years not far from $\frac{1}{2}$ cubic foot per lineal foot. This means that a $\frac{3}{4}$ -inch pipe will deliver four times as much gas as our present average demand more economically than any larger sized pipe. It also means that as against the use of a 4-inch cast iron main you could get greater economy out of a 2-inch pipe until your demand had grown to more than fifty times the present demand.

What I started out to do in this distributing work was to determine how to secure maximum economy. However, there were some factors extremely hard to figure, and not being able to compute the cost of leakage where it took in such factors as killing trees and grass plots and being unable to get rights of way in or under park spaces if there was any leakage of gas to kill either grass or trees I started out with the determination if possible to build a bottle tight system and one which would be free from deterioration.

I divided my system up into transmission mains, feeder mains and distributing mains. My transmission main being the conductor leading from the point of manufacture to and through the distributing system, with a transmission main at right angle to it at the centre of the load, my feeder mains to be of intermediate sizes and my distributing mains to be small and inexpensive per lineal foot and not to have any very great conduct-

ing capacity, as under the system I had adopted this would not be needed.

One of the first things I noticed was the relationship of the wall of the pipe and the economic pressure to be used. Standard wrought iron could withstand the following pressures computed on a fibre strain of 20,000 pounds per square inch:

Size—Inches	Thickness Wall	Weight per Foot	Pressure
2	.154	3.716	2,980
1½	.145	2.748	3,600
1¼	.140	2.300	4,056
1	.133	1.688	5,072
¾	.113	1.138	5,480

Perhaps there has never been any thought given to what should be the thickness of the walls of these pipes.

Even if you figure on a pressure as high as 5 pounds on these distributing mains then the following table gives the thickness and weight per lineal foot of these different sized pipes to withstand this pressure:

Size—Inches	Thickness	Weight per foot
2	.00026	.0060
1½	.0002	.0038
1¼	.00017	.0028
1	.00013	.0017
¾	.00010	.0010

Now, of course, I am conscious of the fact that on account of corrosion we cannot use exceedingly thin pipes, but can there be a more brutal way to resist corrosion than by mere thickness of metal?

I considered the use of very thin pipes protected by cement. I also considered plating the pipes with a non-corrosive metal, or the use of non-corrosive metals or alloys. I also considered the use of paper, fibre and other non-metallic substances. My attention was called to some interesting work in electro plating non-metallic surfaces. You no doubt have since seen this where leaves and flowers have been plated. I considered this as perhaps worth some study. If we could find a cheap non-corrosive material out of which to construct our system we could then flow a solution into pipes and electroplate a thin layer of metal on the interior of the pipes where this metal would not be subjected to corrosion. In fact this was suggested by the great thickness of small pipes in relation to what the thickness would

have to be merely to withstand the gas pressure. I never followed my work out to find how best to use this metal if we finally decided upon metal rather than some other material, but these tables indicate the possibility of a great saving of what is possibly one of our great national wastes.

If we only had to provide enough metal to withstand the internal pressure of the gas, the metal in—

1 foot of 2 -inch pipe would make	620 feet,
1 foot of 1½-inch pipe would make	720 feet,
1 foot of 1¼-inch pipe would make	820 feet,
1 foot of 1 -inch pipe would make	1000 feet,
1 foot of ¾-inch pipe would make	1137 feet.

For the transmission and feeder mains I considered the use of a very thin metal pipe inclosed in a larger vitrified clay pipe, and the possibility of recovering all or nearly all of my leakage by pumping the gas from between the pipes back into the inner pipe and maintaining the pressure on the exterior pipe only slightly above atmospheric pressure. I also considered the use of vitrified clay pipes in such sections of the city where they could be buried permanently below a water level and where any leakage would be water leaking into the pipe rather than gas leaking out.

At the same differential pressure the amount of gas that will pass through an orifice is forty times as many cubic feet as water or to force the same quantity of water through an orifice the pressure would have to be 1,600 times as much.

My next thought was to consider the use of two vitrified clay pipes, one inside of the other and with water between the two pipes. The use of water is objectionable because you must then bury your pipes below the frost line.

I also considered the use of vitrified pipe using a rolling rubber ring between the spigot and the bell. I made some experiments with this form of joint and found it had a surprising tightness and holding power, but was afraid of the solvent action of the gas. We also discussed the use of a rolling lead ring, and also various forms of metal expansion joints.

I took up with some of the ceramic manufacturers the question of making a gas pipe and was quite surprised to find that

they felt reasonably sure they could make a vitrified clay pipe that even with nothing but a cement joint would show less leakage than a cast iron pipe. They were basing their belief primarily on being able to manufacture clay pipe with a negligible coefficient of expansion. I got several engineers and manufacturers interested. However, the other gas men with whom they discussed the problem showed such prejudice against the use of vitrified clay that they rapidly became discouraged. I tried to rekindle interest on the part of one of these manufacturers but without success. His factory was in Ohio and he had talked with a prominent gas man at the head of one of the large companies in the northern part of the state, and I will never forget his remark when he gave me his final decision that he could waste no more time on the subject, and said, "I can deal with vitrified clay but not with vitrified minds."

Prior to the time I assumed the management of the Madison Gas and Electric Company and in fact while I was carrying out the campaign for both heating and incandescent gas lighting which the older men will recall at Columbus, Ohio, I became convinced that highly satisfactory gas service could only be given with a fluctuation in pressure far less than could be secured by pressure regulations at the works or by district governors. Even with rather small installations of incandescent lamps, I could cut down the cost of maintenance enough in a single year to repay the cost of installing a pressure regulator at the customer's meter. When I commenced to work on my Ideal Distributing System, I realized that it would be impossible to work every pipe to its maximum economy and yet give the customer satisfactory regulation without the use of house governors and while enormous benefits flow from the proper design of a distributing system, without the use of house governors, maximum results can only be secured by the use of house governors.

Of course I had to bear in mind the adaptation of existing distributing system to what I choose to call the Ideal System and one of the things that greatly discouraged me in following up this work was the discovery I made in planning the utilization of the existing system. I found, for instance, that vast quantities of additional gas could be sent out into the existing mains at a very small cost simply by raising the pressure at the works by means of a fan blower and curing the effects of ex-

cessively high pressure on the nearby consumers by the use of house governors. My figures showed that this process of adaptation would take care of the system for many years to come without much addition to the large transmission and feeder mains. The figures showed that a few ounces of increased pressure on the entire system would be more effective than a very high pressure on a single pipe. Then my idea was that each year we would make a pressure survey and determine what changes or inter-connections must be made in the distributing system to hold down the otherwise necessary increase in pressure. In spite of the fact that my figures showed a very great increase in capacity without much increase in pressure the actual results have been found beyond either my anticipations or my figures. Every engineer who is also an economist knows what immense benefits are realized by delayed expenditures due to the saving of interest, depreciation and taxes. It looked as though it would be many years before we could make any radical change in our system and my plans for an Ideal System could apply only to extensions. I made a study of one of the largest gas systems in the Midwest about 1902. It was astonishing to see how little money they would have been compelled to spend on their system to secure an enormous increase in conductivity. This company soon thereafter had a change of management and was sold to another syndicate. The new management put in an expensive high pressure belt line system with district pressure regulators. I figured that if they had followed my plan of raising the pressure on the entire system and installing house governors where necessary that it would only have been necessary to spend a portion of the interest on the money that was expended on the belt line system. In other words, if this money had been put into bonds the interest on the bonds from year to year would not only have taken care of the company's increased needs but they would now have a better system than they have today and would not only have all of the original expenditure still invested in bonds but would have a very handsome accrual to this amount through the saving of interest that would not have been required to be spent on the system.

My plan would have provided for the building of small district holders after a few years to be added when needed so as to enable transmission mains to work as nearly as possible to

a 100 per cent load factor, thus greatly increasing their conductivity without increase of pressure.

The younger men in the gas business can have no conception of the violent prejudices which existed in the gas fraternity in the early days against small size pipes, and in fact a great deal of prejudice still exists.

I will cite another example: A young engineer who had received his early training in our properties was called upon to take charge of a medium sized plant in a western city. He started in to lay 2-inch mains and suitable feeder mains from his old system. Later this plant was also sold to one of the syndicates, and in spite of the fact that these small mains were functioning perfectly without any complaint and without investigation as to conditions, all of the 2-inch mains were immediately dug up and 4-inch mains were laid in their place. The only condition under which there has been trouble with the 2-inch mains—and this trouble has also been experienced with other companies on 4- and 6-inch mains—was through the use of instantaneous water heaters. How any man with even a mild conception of engineering and economic principles can view an apparatus of that type without being shocked is beyond my imagination. If the electric business had not learned during its early years that they could not permit excessive demands to be thrown on them and that they must control the apparatus that went on their lines they never would have made an economic success.

Imagine allowing an appliance to go on your line which demands a supply of gas at the rate of 2,500,000 feet per year and yet the appliance will probably use less than 25,000 feet per year, in other words, an appliance giving a 1 per cent load factor. If the customer needs hot water at this excessive rate it is more economical for him to store heat in the form of water than it is for the gas company to store heat in the form of gas. One cubic foot of water over a range of 100 degrees means 6250 B.t.u.'s while a cubic foot of gas means only 600, and the gas company not only has to provide storage for 10 cubic feet but conductor capacity that will take care of this excessive demand without causing a fluctuation in pressure to the other customers to say nothing about supplying a large and expensive meter.

A thorough understanding of the principles which are given in Mr. Griswold's paper will, I believe, give a substantial stimulation to the gas business, for it is possible to serve with this

less expensive system districts that are now too sparsely settled to enable profitable operation when existing practice is used. Many suburbs and small towns that now have no gas supply are worth consideration.

This entire discussion has been prepared with so little time and under such unfavorable conditions that I cannot be sure that it is free from errors.

I fear the lack of proper thought and time to write this discussion has made it difficult to understand what I am trying to accomplish by it, so I will say:

- (1) That Mr. Griswold's paper should show that there is much to be accomplished by proper planning over what is even today the existing practice.
- (2) That I want the young men of the industry to feel they have at least one defender and if they can offer suggestions for improvement of our industry that they can do so without being made an object of ridicule.
- (3) That when properly planned there is but little difference in cost between a system designed to carry large quantities of gas and small quantities of gas.
- (4) That if we are justified in charging all of the costs of a minimum distributing system to the consumer charge when computing costs on the Readiness-to-Serve basis then this item of charge will be very heavy and very light on the demand item.
- (5) That our existing systems can be made to carry a vastly greater amount of gas and enough to displace solid fuel in the home even if dropped to a 300 B. t. u. gas without any vast expenditure.

Now, what I have said above, and especially the thought of planning to largely substitute gas for solid fuel may sound visionary to some, and it may be, nevertheless what is contained in Mr. Griswold's paper and my discussion was just as true twenty years ago as now, and you can judge whether it is common sense and in accord with engineering principles.

I know there are at least some men in the gas business who realize they can profit by it although there may be plenty still to ridicule it. What may seem visionary today will, I hope, be a reality before another twenty odd years have rolled over our heads, or over our graves, as the case may be.

The Group Session on the topic of "The Present Status and Probable Development of Internal Combustion Engines to Consume Heavy Fuels," in connection with the 1922 meeting of the American Petroleum Institute, was held on the morning of December 8. Dr. Van H. Manning, director of research, American Petroleum Institute, and F. R. Coates, president, Toledo Edison Company, alternated as presiding officer.

In the absence of Mr. Doherty, who was to preside and who was on the program for a paper on "How the Problem Looks to Me," the following telegram from Mr. Doherty outlining his ideas on the subject was read by Mr. Coates:



HAVE tried for several years to get the petroleum industry to take part in the development and improvement of the internal combustion engine, and I predict that this meeting will prove the beginning of great accomplishments. It is, therefore, a source of double regret to me that a serious illness in my immediate family keeps me from this meeting. It was my understanding when the program committee met that this session should be devoted to all forms of oil burning engines rather than be restricted to the engines using nonvolatile oil.

The petroleum industry needs in addition to what it now has two types of engines in particular, the first kind being a small engine for stationary use, thoroughly reliable and fool-proof, and this type of engine does not have to have extreme efficiency nor must it necessarily be built to use nonvolatile oil. Automobile engines have been sold as low as \$2.50 per horsepower, but the automobile engine will not stand up under constant load. However, a sturdy type of engine would not cost greatly more than an automobile type engine and undoubtedly cheap and sufficiently sturdy engines will be developed to drive tractors and motor boats that can easily be adapted to stationary use. Cooperation between the petroleum industry and the builders of boat and tractor engines should bring results.

LARGE CAPACITY ENGINE NEEDED

The other type of engine which is badly needed is the engine of large capacity able to use the low priced nonvolatile oils. This type of engine is not only needed for heavy stationary work, but is greatly needed for ship propulsion. In this engine the highest possible fuel economy should be sought rather than an effort to

secure the lowest first cost. However, high efficiency and low first cost are not entirely inconsistent.

It is my opinion that such an engine can be developed having the reliability of a steam engine and of no greater cost than a steam engine plant, including boilers and stokers, with an operating efficiency of 50 per cent or better and a weight much less than the corresponding steam equipment and of greater compactness. It is absolutely necessary to adopt a compound engine before we can get these results. The difficulties which are now encountered in building large sized engines must be overcome for the economy is bound to increase as the volume of the cylinders is increased and where other things are equal. I can see no possibility with the materials now available for the success of an internal combustion turbine. Inventors and manufacturers should be warned against spending money on internal combustion turbines without first submitting their plans to high class physicists.

HIGH TEMPERATURE ESSENTIAL FOR ECONOMY

High temperature is essential for economy. High temperatures can only be properly maintained with the least possible superficial area of heat absorbing and conducting surfaces. It is impossible to secure these conditions in an internal combustion turbine, and the only alternative is some material that will operate at the high temperatures necessary for high economy and capable of withstanding intensive strains due to the necessity of high grade velocity.

In my opinion, it is possible to build a reciprocating type engine which for ship propulsion will have a first cost equal to the annual cost for fuel. This is predicated on the fact that as your economy goes up oil fuel becomes more valuable.

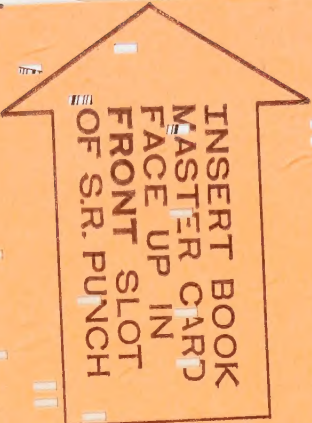
All of the above may sound visionary to many, but I am willing to submit to the criticisms it will bring on me until these predictions are realized, for I believe that these seemingly bold statements are necessary to arouse both the petroleum industry and the engine manufacturers to the real possibilities of the internal combustion engine.

I believe in opportunity for all, but it must come through individual fitness.

—HENRY L. DOHERTY.

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